AMERICAN MACHINIST

A JOURNAL FOR MACHINISTS, ENGINEERS, FOUNDERS, BOILER MAKERS, PATTERN MAKERS AND BLACKSMITHS.

VOL. 3, No. 30. WEEKLY. | NEW YORK, JULY 24, 1880. | $3.00 per Annum. SINGLE COPIES, 6 CENTS.

COPYRIGHT, 1880, BY AMERICAN MACHINIST PUBLISHING COMPANY.

New Emery Grinding and Boring Machinery.

The first engraving on this page represents a machine which, in addition to possessing all the advantages of an efficient emery grinder, may also be used for buffing and brushing. This is done by an extension of the spindle upon which are placed the extra wheels as shown.

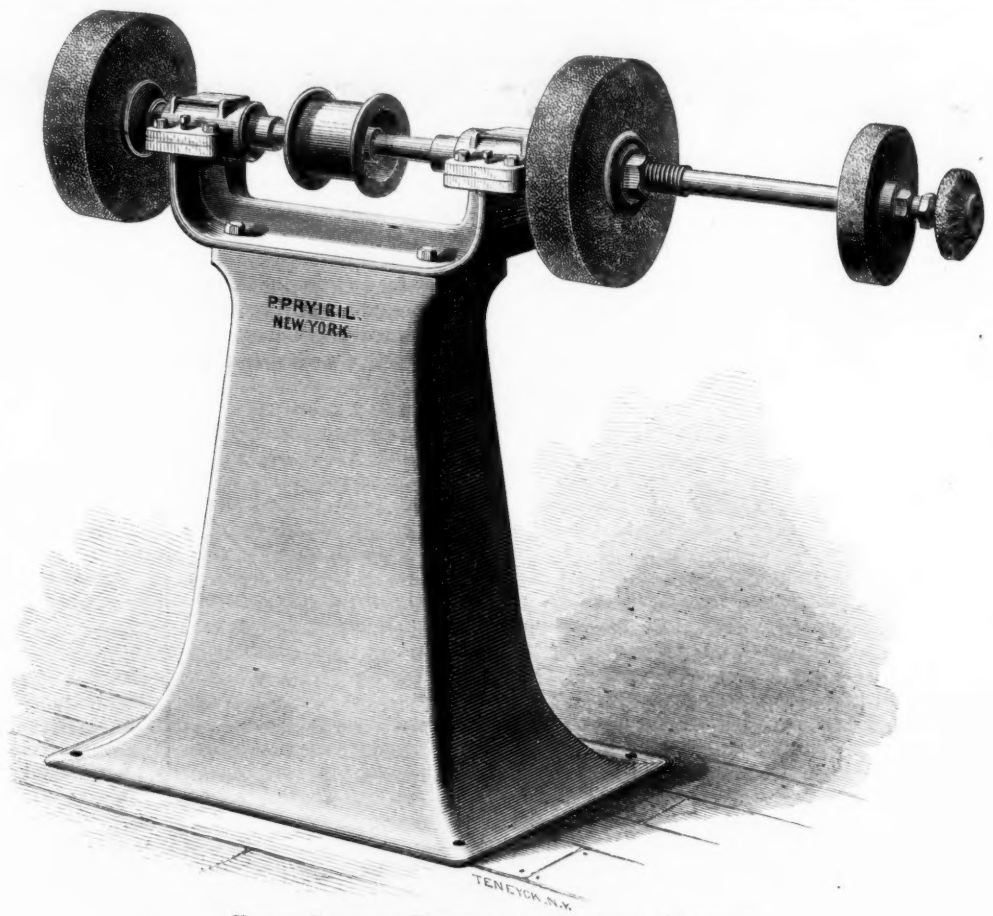
The object in designing this machine has been to furnish a desirable combination to factories and establishments which either cannot afford or have not the room for separate machines, to perform all the different operations. To use separate machines also involves extra expense and a sacrifice of power.

The body is cast in one piece, being built in a very substantial manner, having the bearings separated sufficiently to enable two men to work upon it at the same time. The spindle, which is 36″ from the floor, carries two emery wheels, which may be either covered or solid. The extension referred to is removable, and carries a buffing wheel. Another removable tapered screw extension carries a brush.

These extensions, together with the main spindles, are of steel, and are fitted together so nicely that, when in motion, they run so true that one would suppose they were one solid piece of steel turned without removing from the centers.

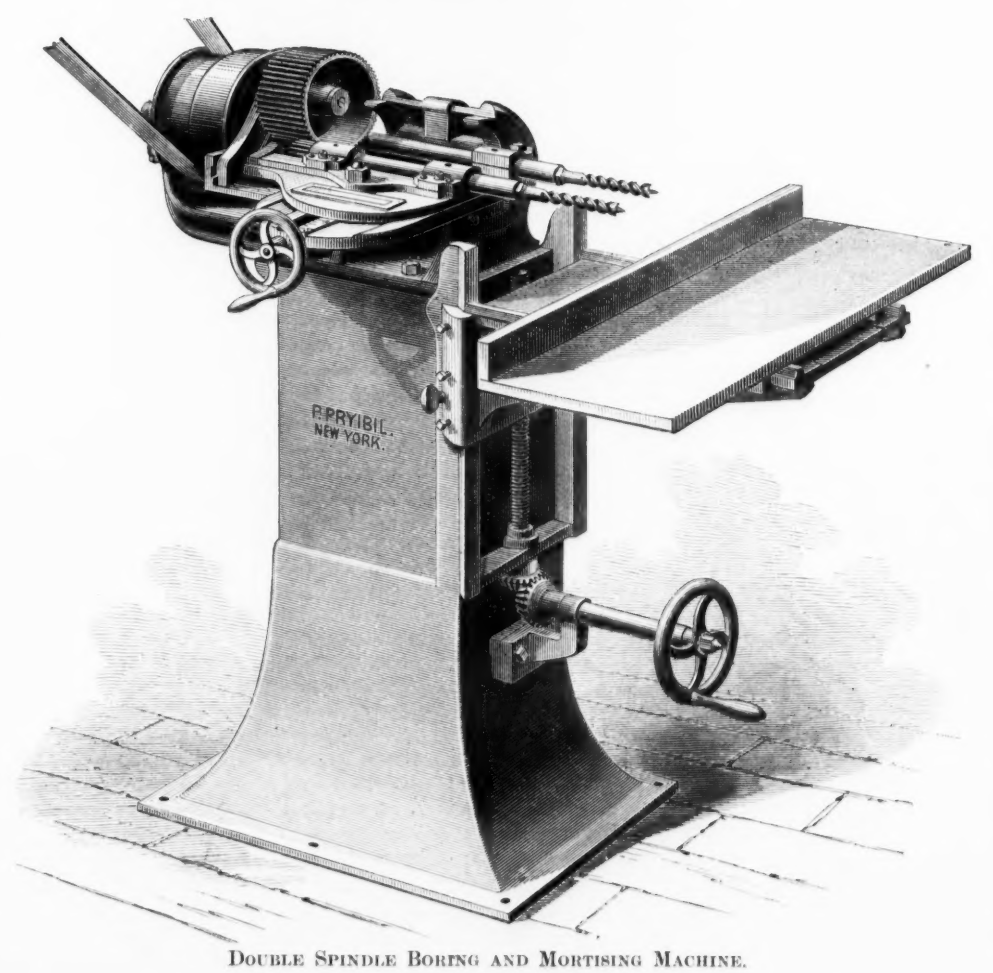
The wheels may be left in place, or, in case they should interfere with a large piece of work, they may be removed in a few moments.

One of the principal advantages of this machine is that a piece of work may be ground, buffed and brushed with but one handling, and without stopping the machine to change the wheels. The operator simply has to step from one wheel to the other. There are six flanged sleeves for bushing wooden wheels furnished with each machine. The speed at the spindle should run is from 2,500 to 3,000, according to the diameter of the wheels.



EMERY GRINDING BUFFING AND BRUSHING MACHINE.

The second engraving upon this page represents an improved double-spindle boring and mortising machine. It is designed to perform with accuracy, and in one operation, that class of work in which two holes are to be bored at a given distance apart and at a given angle, as, for instance, in frame chairs, and in cabinet work, or where strong doweling is to be done. The body is cast in one piece, like the other machine; there are two spindles mounted on an adjustable head, which enables them to be set at any angle from the horizontal to the vertical, or where one hole would be over the other; besides which, the distance between them can be varied from one inch to five inches. This operation may be readily understood by the engraving. The table has a vertical adjustment, and slides forward and backward. When the machine is to be used for mortising as well as boring, it is furnished with a cross slide, in addition to the above. The spindles and their pinions are of steel, and run from 1,500 to 1,800 revolutions. The bearings of both of these machines are well fitted and well proportioned. The different necessary changes may be quickly made, and the adjustment of the spindles is greatly facilitated by the addition of a graduated scale.



DOUBLE SPINDLE BORING AND MORTISING MACHINE.

These machines are furnished with or without the mortising attachment. They are built by P. Pryibil, 461 to 467 West Fortieth St., N.Y.

Practical Draughting—Gearing.

(Continued.)

BY T. P. PEMBERTON.

The number of teeth, their proportions, pitch and diameter of pitch circle are frequently determined on the "Manchester" principle. This system originated in Manchester (Eng.), and is the one long adopted by the makers and users of cotton, flax, wool and other machinery, including tools for iron and wood. It is now far more generally used in this country than formerly, more, however, for determining diameters and number of teeth, which of course, regulate speeds, than for proportioning the size of teeth on the wheels themselves. The system is a simple and easy one, applicable in cases where there are trains of wheels on different planes, and which planes vary from each other in the coarseness or fineness of the pitch of wheels.

For instance, in the construction of different systems in flax machinery, there are "breakers," "hackling," carding, drawing, roving and spinning machines. These require great numbers of gear-wheels, as their cylinders and rollers have different speeds, and each system requires coarser or finer gears. An English mill-owner in ordering his machinery particularizes what gearing he wishes, thus: "Gearing to be 6 per inch," or "8 per inch," or "10 per inch," and the maker of such machinery understands at once the degree of coarseness or fineness of the wheels, amounting in number sometimes to several hundreds. The principle is not applicable to large wheels, but is limited in its application to small wheels, or wheels having "fine pitch," as will be seen in the following explanation, which we introduce here as very useful and indispensable knowledge for the acquisition of the student in mechanical drawing.

The "pitch" of teeth has already been stated to be the center from one tooth to the center of another on the "pitch line," measured on the chord of the arc. In determining, however, the number of teeth or pitch of wheels on the "Manchester" principle, the pitch is reckoned on the *diameter* of the wheel, in *place of the circumference*, and distinguished as wheels of "4 pitch," "6 pitch," "8 pitch," etc. In other words, this means that there are four, six, or eight teeth in the circumference of the wheel for every inch of diameter; hence the technical term "*diametral pitch*" in distinction from "*circular pitch*." Suppose the diameter of the pitch-circle to be divided into as many

equal parts as there are teeth to be given to the wheel; let one of these parts be called the "*diametral pitch*," and let a few definite values in terms of the inch be assigned to it; then it is clear we have this relation:—Diameter, divided by the number of teeth, equals the diametrical pitch; and as the diametrical pitch is always a simple fraction of an inch, we get the following general expressions:—(I.) Number of teeth = pitch × diameter.

(II.) Number of teeth divided by the diameter = pitch. (III.) Diameter = number of teeth divided by the pitch.

For an arithmetical example of the foregoing rules let it be assumed that a wheel of 24 inches diameter is required to have 96 teeth. By expression II. we have 96 ÷ 24 = 4; that is to say, the diameter being divided into equal parts, corresponding in number to the number of teeth in the circumference of the wheel, the length of each of these parts is ¼ inch. Consequently the diametral pitch is *four pitch*, or, in workshop phraseology, "4 *per-inch pitch*." Taking expressions I., II., III., as verbally written, and transposing for this wheel into figures, we have: (I.) 4 x 24 = 96 teeth, (II.) 96 ÷ 24 = 4 pitch. (III.) 96 ÷ 4 = 24″ diameter.

The "circular pitch" corresponding to this "diametral pitch," is found by the properties of the circle (previously explained) to be ¼ or .25 x 3.1416 = .785, or a little more than ¾ of an inch from the center of one tooth to the center of another on the pitch circle.

In setting out a wheel on the "Manchester" principle, it is convenient to know what the circular pitch will be when the diametral pitch is fixed upon. Suppose a wheel is wanted, or a system of gearing, which is to be 8 per inch. The diameters are easily found by dividing the number of teeth by 8; for instance, wheels having 64, 56, 48, 32, and 16 teeth, respectively, would be 8″, 7″, 6″, 4″, 2″ diameter of pitch line; but unless the circular pitch is known, the pitch circle would have to be spaced off by repeated trials to get in the required number of teeth. The following table will be found useful:

Diametral Pitch.	Circular Pitch.
1	3.142
2	1.571
3	1.047
4	.785
5	.628
6	.524
7	.449
8	.393
9	.349
10	.314
12	.262
14	.224
16	.196
20	.157

From this table it will be at once apparent when the diametral pitch and the diameter of the pitch circle are known, the circular pitch can be taken in the dividers and the centers of the teeth spaced off (approximately) at once upon the pitch line.

Wheels of this description have generally their teeth cut in a gear-cutting machine; patterns with teeth of so fine a pitch are seldom made. Therefore in practical draughting it is usual to draw out a segment of the wheel and show part of the rim and a few teeth only. The diameter, pitch, number of teeth, width of face, size of hole, diameter and length of hub should be distinctly given

New Horizontal Steam Engine.

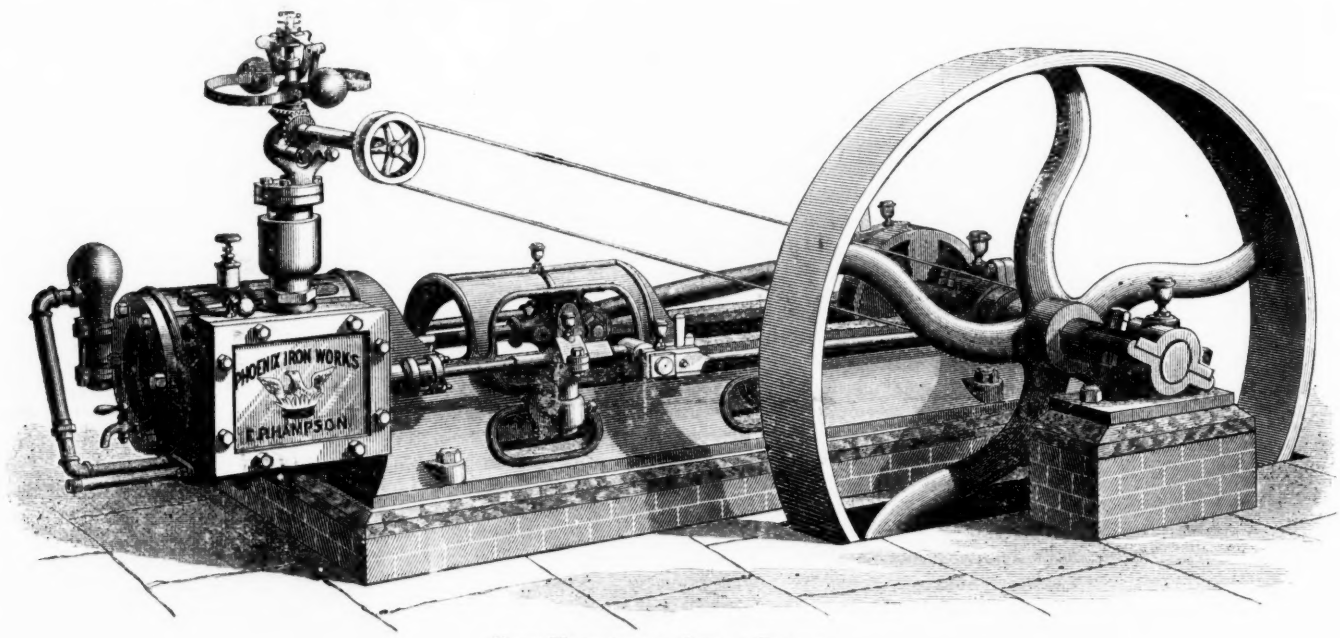
It has often been remarked that the steam engine, as built by the competent engineers in its present condition, is probably the nearest approximation to perfection that will ever be attained, and yet from time to time certain alterations are made, or some new ideas advanced, which are claimed to be decided improvements.

In some cases these claims are just, but frequently there is nothing gained by adopting the new designs.

Our engraving represents a horizontal stationary engine which embodies some novel and valuable features.

The bed plate is of a pattern which secures great strength without an excess of material. The guides are cast solid with the bed, the shape of which may be readily understood from the engraving. The end of the bed, which forms the cylinder head, is faced up, and the guides are bored at the same time, thereby ensuring perfect alignment with the bore of the cylinder, which is afterwards bolted to the bed plate. The bearings upon the guides are of unusual width, and by the application of composition gibs are well calculated to give very excellent results. The ports are of large dimensions, and the valve motion is designed to develop a high rate of speed. The guide for the valve stem is provided with a vertical adjustment so that a perfect alignment may always be secured.

A feed pump is attached to this engine and is operated by an arm projecting from the cross head. The exhaust being at the lowest part of the cylinder, takes away all the water which would otherwise accumulate. After leaving the cylinder, the exhaust steam passes into a heater which extends along the center of the bed plate just beyond the end of the guides, and heats the feed water. The exhaust pipe can be attached to either side of a double connection, which may be the most desirable The bearings are all large and the parts well proportioned, and being well balanced the engine is well calculated to run at a high rate of speed. The pillow blocks are furnished with either large cups or oil boxes as desired. This engine is being introduced by E. P. Hampson, 91 Liberty Street, New York.



NEW HORIZONTAL STEAM ENGINE.

The village of Catskill, N. Y., proposes to have water works. A reservoir is to be built, and the water pumped from the Hudson river. Although no contracts have been made, the project is taking definite shape.

Extracts from Chordal's Letters.

My Editor:

* * * * I spent a couple of hours in Sackett's office the other day. It was his day for growling at what he elegantly termed the "damfoolishness" of the average mechanic. Sackett is a rich man, and owns a big shop, and works lots of men, but he has never forgotten that he worked with overhauls on for twenty-five years himself. If there is a man living who is kind, generous and noble, that man is Sackett. If machinists have an unselfish sympathizing friend who feels keenly and painfully all their little ills, that man is Sackett. If any proprietor has the confidence, good will, and firm friendship of his men, that man is Sackett. If any man puts a high value on this good-will and friendship, that man is Sackett.

* * * * Sometimes you will find the owner of a shop who will say that he cares nothing for the art, and looks only to the profit of the business. He looks at every fine achievement simply as a something which sells for more than it cost. He looks at the men the same as he does at the bar iron. He thinks they are worth paying money for because they will bring more in. He cares nothing for them. Such an owner would turn his business into lard-rendering if it promised more profit.

* * * * Again you will find an owner who is an enthusiastic mechanic. He goes three hundred miles, less to settle with a customer than to "see how the thing looks, after it is set up." In the weakness of his soul he imagines he is running a shop for money, but in reality he cares more for the shop than the office. The character of a fit is more to him than the cost of a fit.

He is annoyed at finding he can't do certain nice things because it would impoverish him He likes his men, and recognizes them as fellows with him in an art. Men and owner are in full sympathy, but pay day is always a close call for both parties. Such an owner as this would not run a rendering establishment for any money, and if he was worth millions he would begin to squander it on elegant little machine shops.

* * * * This reminds me that I have heard that Babbitt, the soap man, struggled for years trying to get bread and butter out of the machine business, in which he was an enthusiast. He gave it up and proceeded to make a prince's fortune out of soap Now he can afford to run a machine shop, and is turning his interested attentions in that way.

* * * * Sackett is different from any of these men. He is to a certain extent an enthusiast, and never loses his interest in machinery. He can admire things which he don't make himself, and can criticise his own work. He thinks so much of the business that I think he would run a shop whether there was any money in it or not. He is also a money man, and proposes to make something on what he does. I believe he would be in some money-making business if he had a dozen shops, or if he didn't have any.

But Sackett's main interest and thought is his men. His hobby is not fine work or profit but machinists.

I don't believe Sackett ever figures on a job but what he thinks of "we," that is himself and the men. During the hard times Sackett put wages down to a point which would allow him to keep all his men, and during all that time he did not make the price of a new pair of boots for himself.

* * * * One day during the hardest of the hard times he showed me his pay roll, and said he was paying fifty per cent. more than any one else. He said he could discharge every man and fill his shop with willing men at the lower pay. But he said he was selfish and was studying policy. He favored me with quite a dissertation on economy:

"Mortimer was in here yesterday and was telling me how he had kept things even. He keeps as few men as possible and pays as little money as possible, and let every non-producer go; oilers, cleaners, tool-room men, timekeeper, yardmen, draughtsmen, etc., went by the board. He changed his grades of oil and waste and coal, and shut off advertising bills and reduced printing and general office expenses. In this way every cent paid out brought in a return; and Mortimer told me this without blushing, and seemed to be proud of his management. Now," continued Sackett, "I happen to know Mortimer to be a fool in this respect. I have been over his shop carefully. He has got a lot of men in there which I wouldn't allow to come into my shop and damage my tools. He don't pay them anything, and they give nothing in return. I can do work cheaper with my two dollar men than he can with his ninety cent men."

"His tool room was tip top, and worth lots of money, and I always envied him the possession of it. But a tool-room outfit is only valuable so long as it is kept up. These tools are very expensive and indispensable to economical workmanship. Each tool is worth but little, but few men imagine what the total amounts to. A fluted reamer, up to size and in order, may be worth twelve dollars, and in a week it may lose size and be damaged by neglect, and not be worth three dollars. Run this reduction through the big total and see how it looks. Mortimer took his tool-room men out and gave those slouchy men the run of it, and my estimate is, that six months of the horrible business has cut down the invoicing value of his tool-room ten or twelve thousand dollars. Economy, indeed! When the 'flats' struck me I thought I saw a slack opportunity to bring my tool-room up to standard, so I put one new man in. Wages were low and steel was low. There was not a tool that was not thoroughly overhauled, and to-day there is not a piece of steel inside the 'bar' which is not of full value. It is in

better shape than I ever dared hope to see it, and if good times ever return I will have made ten thousand dollars clear money by my tool-room operations alone.

"When good times come to Mortimer, he will be bankrupt in trying to get his shop on its legs again, or else he will go right on with his impaired facilities, and will lose his high place in the trade.

"I also changed the grade of my oil. Oil was so cheap that I took to the finest grade, and it has proved so profitable that I don't think I will ever go back to a cheaper oil. Instead of letting the shop go to the dogs, I now pay special attention to shop repairs, and have rooted out every worn out, non-paying tool, and am getting every one put in the very best of condition. I am remodeling the shop somewhat, and can now fix things which never could be fixed before.

"I hope never to have another opportunity of doing all these things so well, and at so little cost. If a change in business prospects ever takes place, you will find me on hand, ready for it, with a tip-top shop, with no bad tools in it, and with a score of men that it pays to pay money to.

"If good times stay away much longer, I don't think Mortimer will have any shop. He is not hardup, but has got that queer economy of his on the brain, and I believe it will get away with him. I have known him to sell a lathe because it was doing nothing, and he spends no money to keep the others up. His experience ought to tell him that if a reaction in business takes place, it will be impossible to get anything out of the tool-building shops for months, and that the prices will be extra for the rush.

"Bad as times are I am getting some business, but, of course, there is no money in it, but it keeps the men here I work for this business all the time, and don't propose to have the trade leave me when the music begins. I am not trying to get rich by saving postage stamps and advertising bills; in fact, these bills, even at present low prices, are heavier than they have ever been before. When Mortimer was telling me of his fine operations, he mentioned the fact that he had heard that a St. Louis firm spent four thousand dollars a year for postage. He said that was all nonsense and bad management, and that a proper economy there would yield an income in itself. What nonsense! That four thousand dollars postage was the very thing which brought the business of that St. Louis house, and prudence would suggest the doubling of the expenditure. I tell you, Chordal, when a man is in a business, in which paying out money is its base, he can't economize by cutting such things; a merchant might as well try to accumulate by putting money into bank, instead of buying goods."

* * * * This talk took place long ago, and I might say something startling regarding Sackett's prophecies; but I commenced to tell you of his new growl the other day. I intended to say that Sackett thought more of the workmen associated with him in business than he thought of anything else. Sometimes he finds a stupid lack of appreciation on their part, or perhaps he finds himself thwarted in his good intentions, or charged by the men with wrong motives. Then he gets tired, and then comes his growling day. Sometimes he says his men are a pack of fools, not to appreciate his real feelings towards them, and than he will intimate that he thinks he is the biggest fool in the lot to waste any feeling on them.

* * * * The other day he opened out with: "You know, Chordal, what wages I pay. I always want better men than anyone else has, so they are high-priced men, of course. Such men are worth more to me than they are to anyone else, so I pay them still more and they stay. These people who steal workmen in good times don't bother me any. They are welcome to all they can get away. I know it pays to keep such men and pay such wages, because I see my competitors are always behind me on costs. I say all this in support of the statement that I keep good men. And still these men are always open to believe that I have no sympathy with them that I don't pay a cent more than I am compelled to; and that I am a lazy capitalist growing rich off their sweat. I sweat over the affairs of life more than the whole gang of them, and when you come down to real truth I question if I don't concern myself and worry myself more over their affairs than they do themselves.

"There are hundreds of proprietors just like myself in this matter, and they are always getting kicks from the men The fact is, I have almost come to the conclusion that those chaps who do as little as possible for their workmen get about the best treatment in return. You know mighty well, Chordal, how I and many others have acted toward our men in the last few years, and now I propose to listen closely to the news of the day, and see if I can hear of anything particularly white from the men in return.

"I don't mean in regard to wages at all. That matter is foreign, but I mean in spirit and general attitude.

"For eight years past the bone between me and my men has not been that of profit from them, for there has been none. If my men recognize any bond between us now except that of pure sordidness, or impure sordidness rather, I am not aware of it."

* * * * Very respectfully,

CHORDAL.

Holyoke Turbine Tests.

We give this week a continuation from our issue of July 3, of the tables of turbine water wheel tests made at Holyoke, Mass., last fall. Some of the wheels tested are referred to by Mr. Samuel Webber as follows:

"The wheel given in the table as the 'New American,' was built by Messrs. Stout, Mills & Temple, of Dayton, Ohio, and although the base and gate arrangement was that of their old wheel, known as the 'American Turbine,' the wheel was altogether different, having a downward discharge instead of an inward, and the buckets appear to be a fac simile of those of the Swain Wheel. It was, of course, impossible to get at them so as to verify the curves exactly; but there is no doubt that the merit of the wheel is due to the adoption of the Swain type of bucket. The 'power-curve,' obtained from a diagram made by taking the per cent. of water used at the different tests as the ordinates of the curve, and the per cent. of power obtained as the abscissa, is very similar to that obtained in the same way from the Hercules Wheel, but falls a little under it all through.

The Tyler Wheel, also has a downward discharge, and is of the same pattern as the one tested by me at the Centennial in 1876, and gave very similar results to those obtained then, and what may be called very good results for a 5 ft. wheel.

The Houston Wheel is well known—from its resemblance to a bevel-gear, discharging the water downwardly and inwardly: but while it gave excellent results at full gate, the part gate tests were very poor, and the gate moved with great difficulty under the full head. In fact, it was impossible to open it, with the gate shaft and gear, which were attached to it, when the full head of 18 feet was on, and we had to open the gate first, and then fill the flume up with the wheel running.

The Gates Curtis Wheel was like the Houston, but with a somewhat different gate, and was only tried at full gate.

The Monarch Wheel was a nondescript affair, from the "piney-woods" region, and consisted of two wheels, one above the other on the same shaft, with a set of guides curved in the opposite direction between them, the buckets and shutes being wound around central cores, the whole being enclosed in a cylindrical casing to which the shutes were fastened, so as not to revolve. It was nothing but the same old absurdity of using the water twice over, which has been so often tried before.

The Sherwood Wheel was an inward discharge.

The writer was called in at the eleventh hour, owing to the non-appearance of several other engineers who had been invited; to see that the tests were fairly made, and the measurements correct.

These he can vouch for, so far as shown in the tables, and every effort was made to have these tests fair and correct.

He, like the gentlemen who got up the test, was much disappointed by the absence of several of the prominent wheels, which were expected to be tried, and the report is consequently a meager and unsatisfactory one."

Oct. 21, 1879. Test of 60 in. Turbine, from Clark & Chapman, Turner's Falls, Mass. 12 feet Weir, 20 feet circumference of Friction Pulley.

No.	Load in pounds.	Rev. per Min.	Head in feet.	Weir in feet.	Cu. feet Water per Min.	H. P. Wheel.	H. P. Water.	Per cent. Effect.
1	1100	157.6	17.13	1.566	4453.30	105.08	144.00	.7292
2	1200	149	17.15	1.570	4470.53	108.36	144.82	.7482
3	1300	139.2	17.17	1.569	4466.22	109.67	144.85	.7571
4	1400	131	17.14	1.568	4461.91	111.15	144.46	.7694
5	1500	118.5	17.14	1.570	4470.58	107.73	144.72	.7443
6	1600	105.5	17.10	1.565	4449.	102.30	143.70	.7019
7	1375	130.5	17.10	1.564	4444.4	108.75	143.43	.7582
8	1425	125	17.12	1.565	4449.	107.95	143.87	.7503
9	1400	128.2	17.12	1.561	4432.3	108.78	143.33	.7589
10	1400	120	17.19	1.519	4252.3	101.82	138.07	.7374
11	1350	125.5	17.20	1.516	4239.58	102.68	137.74	.7455
12	1300	114	17.37	1.425	3859	89.83	126.61	.7095
13	1300	124.75	17.37	1.419	3837.28	90.73	125.9	.7206
14	1100	125	17.49	1.352	3556.57	83.33	117.5	.7092
15	950	125	17.66	1.260	3197.30	71.97	106.65	.6748
16	800	130	17.76	1.188	2929.58	62.73	97.97	.6403
17	850	123.5	17.76	1.193	2939.45	63.63	98.61	.6453
18	700	128.5	17.85	1.118	2658.82	54.51	89.65	.6081
19	675	123	17.93	1.080	2519.93	50.32	85.34	.5896
20	650	126.5	17.92	1.076	2505.45	49.83	84.81	.5876
21	550	122.5	18.03	.996	2221.05	40.83	75.64	.5400
22	500	131	18.04	.995	2217.56	39.70	75.57	.5253
23	1400	126	17.09	1.565	4449.	106.91	143.62	.7444

Oct. 16, 1879. Test of SMITH'S SUCCESS WHEEL, 40 in. diam., from York Manufacturing Co., York, Pa. 12 feet Weir, 15 feet Circumference of Friction Pulley.

1	850	170.5	17.87	1.063	2484.16	65.87	83.80	.7856
2	900	162.5	17.88	1.065	2489.36	66.48	84.07	.7906
3	950	153.3	17.87	1.074	2523.8	66.21	85.19	.7772
4	875	165	17.86	1.065	2489.36	65.62	84.07	.7805
5	900	161.5	17.85	1.068	2502.15	66.07	83.42	.7920
6	925	157	17.83	1.071	2512.98	66.01	84.63	.7800
7	850	154	17.96	.989	2322.28	59.5	75.01	.7932
8	800	163	17.97	.982	2197.97	59.36	74.66	.7951
9	550	163.5	18.19	.816	1646.26	40.85	56.56	.7222
10	575	159.25	18.12	.819	1653.8	41.62	56.60	.7353
11	450	171.5	18.26	.762	1477.65	35.08	50.96	.6881
12	475	165	18.26	.765	1486.77	35.62	51.32	.6940
13	500	160	18.25	.769	1490	36.36	51.67	.7037
14	525	154.5	18.25	.773	1511.46	36.82	52.10	.7067
15	565	145	18.24	.779	1530.06	37.24	52.71	.7065
16	400	150	18.35	.683	1340.92	27.27	43.01	.6340
17	375	157	18.34	.675	1217.67	26.88	42.19	.6371
18	375	162.5	18.34	.689	1258.46	28.15	43.59	.6458
19	450	142	18.34	.705	1305.37	29.04	45.18	.6428

Oct. 15, 1879. Test of "HUMMING BIRD," Turbine, 36 in. diam From Willis Read, Danbury, Conn, at Holyoke Flume. 12 feet Weir, 20 feet Circumference Friction Pulley.

1	850	103	17.84	1.077	2485.75	53.06	83.18	.6378
2	900	95.8	17.84	1.095	2551.18	52.35	85.38	.6120
3	825	106	17.83	1.079	2493	53	83.38	.6356
4	850	103.3	17.85	1.085	2514.77	53.22	84.27	.6320
5	875	97.5	17.82	1.096	2554.83	51.70	85.40	.6053
6	675	105	18.06	.953	2049.21	42.65	69.42	.6143
7	650	102.6	18.04	.950	2038.97	40.42	69.04	.5854
8	525	103.2	18.18	.842	1680.26	32.84	58.04	.5680
9	400	95.6	18.34	.728	1328.28	23.76	45.70	.5199
10	350	103	18.34	.720	1301.28	22.49	45.08	.4989
11	300	96	18.52	.682	1185.09	17.45	41.48	.4206
12	250	105	18.44	.642	1074.24	15.91	37.41	.4252
13	650	107	18.00	.933	1986.13	42.15	67.53	.6100
14	650	103.5	18.06	.935	1987.97	40.77	67.82	.6012
15	500	106.75	18.26	.836	1661.21	32.35	57.11	.5665
16	350	106	18.35	.742	1277.42	22.48	44.34	.5070

Oct. 18, 1880. Test of 30 in. TAIT WHEEL, Rochester, N. Y., 12 feet Weir. Circumference of Brake Pulley 15 feet.

1	750	135.3	18.28	.859	1742.56	46.13	60.17	.7667
2	700	145	18.28	.850	1713.35	46.136	59.16	.7791
3	725	140	18.27	.852	1719.83	46.136	59.35	.7773
4	675	148.75	18.32	.845	1697.18	45.64	58.73	.7771
5	650	151.5	18.31	.842	1687.7	44.76	58.37	.7668
6	650	149.75	18.34	.818	1619.69	42.77	56.11	.7623
7	600	153.25	18.36	.808	1579	41.80	54.77	.7632
8	600	145.5	18.39	.786	1516.16	39.68	52.67	.7517
9	580	149	18.40	.783	1500.57	39.28	52.15	.7532
10	525	150	18.45	.744	1380.58	35.80	48.11	.7441
11	475	146.25	18.50	.700	1248.86	31.58	43.64	.7236
12	450	152	18.50	.697	1240	31.09	43.33	.7175
13	350	157.25	18.57	.635	1061.43	25.02	37.23	.6720
14	375	150.5	18.57	.637	1067.07	25.71	37.52	.6868
15	350	141.5	18.66	.565	869.71	18.39	30.72	.5985
16	250	151.25	18.67	.557	848.54	18.56	29.92	.6188

Oct. 22, 1879. Test of 35 in. Turbine, from Gates Curtis, Ogdensburgh, N. Y., at Holyoke Flume, 12 feet Weir. 15 feet Circumference of Friction Pulley.

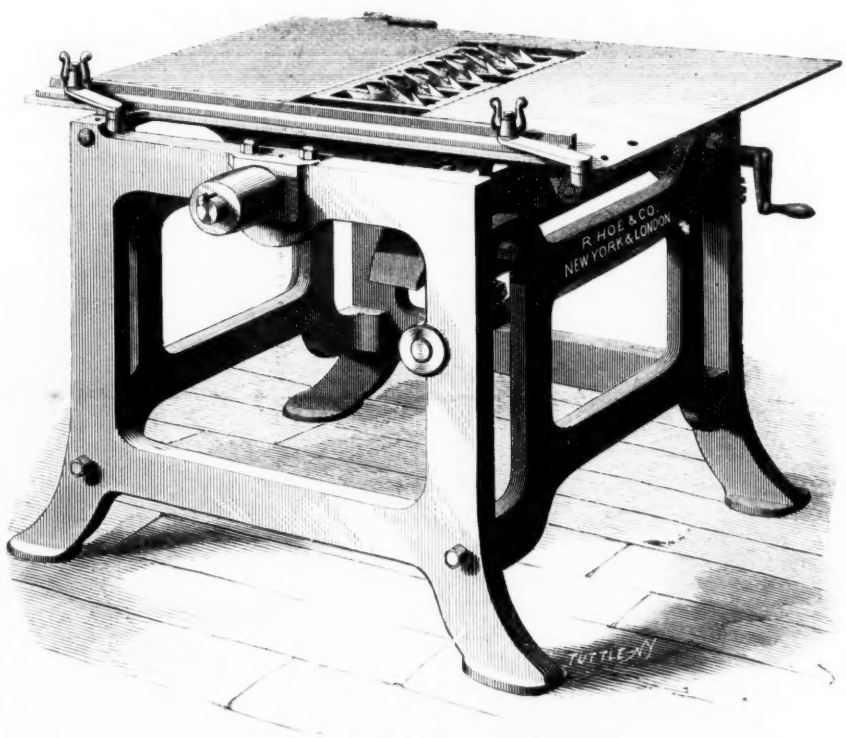
1	900	193	17.76	1.184	2005.32	78.95	97.46	.8101
2	1000	178	17.77	1.184	2005.32	80.91	97.52	.8267
3	1100	165.5	17.76	1.196	2050.85	82.75	98.99	.8363
4	1200	152	17.75	1.204	2081.31	82.91	99.98	.8292
5	1300	138.5	17.33	1.210	3004.24	81.84	98.34	.8322
6	1050	171.33	17.77	1.197	2054.65	81.77	99.17	.8245
7	1100	159	17.74	1.200	2066	83.11	99.39	.8362

Oct. 27, 1879. 2 Wheels like last, placed on Horizontal Shaft, and discharging through Central Draft Tube. 12 feet Weir, 20 feet Circumference of Friction Pulley.

1	1500	141	16.37	1.864	5783.07	128.18	177.70	.7213
2	1400	150.5	16.38	1.862	5773.75	127.70	178.64	.7148
3	1450	145	16.39	1.865	5788.73	127.42	179.24	.7110
4	1500	140.6	16.40	1.865	5788.73	127.82	179.49	.7121
5	1350	155	16.40	1.857	5751.50	126.82	178.17	.7118
6	1300	159.25	16.39	1.855	5732.91	125.47	177.48	.7069

No Gate to these Wheels—intended to run under Full Head of Water.

Bookbinders' Table Sawing Machine.



BOOKBINDERS' TABLE SAWING MACHINE.

The machine represented by the engraving on this page is a new, compact bookbinders' table sawing machine to work by power. It is made entirely of iron, and is designed especially for book sawing.

The table is hinged to the frame of the machine, and is held up out of the way by a counterbalance while the saws are being changed. It is adjusted for sawing from both ends, and by this means a great nicety is attained in regulating depth of saw cut. It has also an adjustable side gauge. The brass sliding frames, or trucks, are easily set and can be used for any sizes of books.

The mandrel is of steel, so arranged that there can be no side play, and the saws can be taken from mandrel without lifting it from its bearings.

When desired, the machine is provided with a light wood and iron box, arranged to be guided by the table on which the books are placed, and securely held by an adjustable spring and catch before being passed over the saws.

The cut gives an idea of the simplicity and convenience of this machine. It is made by R. Hoe & Co, New York City and London, England.

The Red Wing Furniture Co., Red Wing, Minn., now employs twenty-five men, but expects to increase the number to one hundred in the fall. The company began business March 1st.

Marking Machinery.

BY EGBERT P. WATSON.

There is scarcely any minor detail of the machine business that is so generally neglected, as the simple matter of marking parts that belong together. First-class shops are as often sinners in this respect as any others, and the loss of time, to say nothing of the injury often entailed, demands reform. Any one who has unshipped a section of a heavy screw-shaft at sea with its 2½″ or 3″ bolts fitted to reamed holes, and only a narrow, slippery sheet iron tunnel to work in, knows how pleasant it is to the man who stands on his head trying to connect at the coupling again, to find there are as many different sized holes as there are bolts, and that he can try every one of them before he has luck enough to hit the right one. A smart man will mark them before he unships them; but for one smart man, there are ninety-and-nine stupid ones who are not paid for smartness, and they are the ones to mark parts for. In any case, if pieces are marked, it is often so illegibly done that a man with the eyes Sam Weller wished for, "of double million magnifying power, that could see through a deal door," could not make out the intentions of the marker.

Marks that will answer in one place, or for one class of work will not do for another. The prick punch — bosom friend of the slouch and half bred machinist, is a nuisance of an aggravated character on castings and work that go together in the dark; in the grime and gurry of the wheel-pit, possibly. It makes a man happy when he has some heavy spur-wheels to put on, to find them marked like this .˙. on the outside of the hub, or on the pitch of the teeth, or as likely as not on the face of a tooth, or anywhere a person would never think of looking for it. Even if by chance you stumble across the track of the prick-punch, you cannot be sure it is not a blow-hole, or a blister, or a chance grain of sand that has fallen in the flask. The proper way to mark rough work is so that it cannot possibly be mistaken for anything but what it is, as in the diagram; with a good, honest flat chisel, ¾lb. of an inch wide, and an old-fashioned center punch that makes a three-inch hole every time you hit it; thus:

A graven image could not puzzle over what these marks mean; you can fall into them in the dark.

If fine finished work is to be marked, there are letters which come into play and answer all purposes much better than the celebrated prick-punch; but the heinous offence of too many machine makers is, that they don't mark with anything. They make "fits" that are close for a third of the bearing, but suddenly give way when they are half home, and fly up or stick fast to the great injury of good morals and the machine as well. People who do such work should send instructions or a letter of warning that it may be expected, and action taken accordingly, or put marks on so that they can be seen and certified to, if necessary, by the shop-sweeper.

A firm sent some boilers to Colorado, of a peculiar kind. When they were erected they would not work. Upon investigation it was discovered, after sending a man there from New York, that half the castings were put up anyhow; doors left out that should have been put in, and deflector plates used as floor plates for the fire-room. A sermon without the benediction!

The new mammoth hotel at Rockaway Beach is 1,252 feet long, and averages 300 feet wide. It contains 1,045 sleeping rooms. The piazza fronting the sea is 70 feet wide. This is, without doubt, the largest hotel in the world. It will be finished about the 1st of August.

Oil Holes.

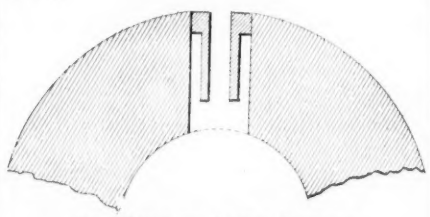
(A Paper read by John Coffin before the Syracuse Mechanical Association.)

Mr. President and Fellow Mechanics:

While I have selected for my subject "Oil Holes," I am not going to talk about petroleum wells as they are a little too deep for me; but have taken a branch with which we are all familiar, one easily comprehended, one whose depths can be explored with comparative ease—and that is oil holes in machinery.

The early history of oil holes is clouded in mystery. Some historians state that Noah used oil holes in the machinery of the ark, while others claim that the hinges of the gate of the garden of Eden had oil holes in them and that Adam went around every Monday morning with a ten penny nail to clean them, out. However that may be, since oil has been used on machinery oil holes have been in vogue.

For the benefit of those who do not know what an oil hole is, I will state that it is a small canal to conduct oil to the working surface of machinery. Sometimes it fails to conduct it, then a ten-penny nail is the thing to use.



OIL HOLE IN LOOSE PULLEY.

I have read in the History of Grease about some kind of a patent oil hole for loose pulleys, I have never seen any of them; in fact all that I have ever seen were straight holes—regular centrifugal pumps, throwing out all the oil that does not happen to soak into the joint before the wheels start.

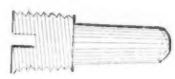
When I oiled line shafts I used to carry a lot of pine plugs in my pocket, and when one was missing I replaced it with a new one, not because I was ambitious to do a good thing, but because I had to do it. A plug in the oil hole of a loose pulley is a good thing. How much machinery comes to us into which we can not get oil; if we are fortunate enough to find the place we oil it once. You have a lathe in the shop with oil holes in the apron for every stud and gear except one or two. When you put up the lathe you notice those places and resolve to keep them oiled, so you make a tin eave spout to run oil into them, and hold it in one hand and pour oil into it with the other. That is all right, but after a while you put a new hand on the lathe who never saw that make of lathe before. He knows that some machines have hidden oil holes, thinks he will oil all the places he can see, and trust to Providence until he learns the machine better. He finds out at the end of two or three weeks that Providence is not in the oil hole business.

Farmers in general do not find the oil holes in their machinery. If I were making agricultural machinery, I think I would paint a regular bull's eye around every hole, and then print a circular telling them to oil all the bull's eyes, and every thing will be all right. If they did not understand that, I would paint oil cans all over the machines; then they might take the hint if they did not think that it meant they were self-oiling. Do not counter-bore oil holes unless you do it on the other end for it makes a bigger place to catch dirt and dust.

If you cannot get oil into machinery without a funnel use a portable tin one. Brown & Sharpe have a good dodge on oil holes. They stamp OIL HOLE around the hole, and if the machine is clean and the man can read he knows where to oil and does not oil the pin holes, and let the oil holes go.

In shops where they use axle grease, oil holes must be big enough to let it down. Who ever saw an oil hole stopped up because it was too big? When grooves are made in boxes they should be large. It is a good practice to counter-bore oil holes on the inside if it can be done, as in the case of half-boxes, oil holes through studs and the like. For loose cones in back geared machinery I like a piece of leather in a counter-bored recess better than a screw, because the cone can be oiled without a screw driver.

If you are resolved to put in screws, allow me to make a suggestion. Suppose you make them like the sketch, then you can run



them out without feeling your way, and still keep the screws. I drop the screws about every other time, and I reckon everybody else does so too. The longest lubricating hole I ever saw in proportion to its size, was in the Remington shops; a hole four feet long in a ¼″ rod used rifling. The object is to lubricate the tool. I asked how they got the hole through it. "Oh, drill it; we do not consider that difficult." Some things come with brass oil cups on them designed to put wicking in. We generally leave the candle wicking out, as we are out of candle wicking. When we start that thing, and leave it until we get the next ball. My opinion is that the wick is good, and pays to put it in. However, the brass cup is a good thing without the wick, as the cover keeps out the dirt and men like to oil brass; that is why they put brass in connecting rods. There is a new vise being introduced in town. One of the good points is a neatly fitted pine plug in the oil hole. Until we get a better thing to stop up oil holes with, I hope we will have plenty of pine.

Letters from Practical Men.

LINING UP SHAFTING.

Editor American Machinist:

In your issue of July 5 your correspondent, A. Forest, writes on the subject of lining shafting. I would offer another way which I do not recollect seeing in your columns. It is an old plan and one that I have used many times, both in extending lines of shafting and relining shafting that has shifted from true line.

Take a fine line of proper length, fasten a weight at each end, say a pound, place one over the shaft at each hanger, if needed in such a position that the weights will be, say, one 6″ above the other. Let them hang free over the shaft. By placing a line over the shaft at each end, and drawing a fine line equal distance between them, you can extend the line to any length required. If relining, place the line under the point where you wish to bring the center of the shaft, then by hanging your double plummet on the shaft near the bearings, it is easy to see when it is in proper line, and any variations in size of shaft do not affect it. I have sometimes placed a pail of water so that the plummets would hang in the water. They will not be so easily affected by wind or any slight cause for variation. A good level and straight edge is indispensable for leveling; unless they are nearer perfection than some in use they should always be used the "same end to," and not reversed, as in so doing it will bring the shaft in a wave line if either tool is imperfect, while in keeping them the same way the line will be straight, but might be higher at one end. Of course no variation to any great extent would be admissible even under this rule.

Did any reader of the AMERICAN MACHINIST ever try to level a shaft by using a small rubber pipe with a glass tube in either end, so that by holding the tubes in position the water (in the tubes) will show the proper level between any two points? If so, I should like to hear with what success.

Yours respectfully,

Springfield, Mass. J. E. STANNARD.

BOILER COVERING.

Editor American Machinist:

The loss of heat by radiation from a boiler has been variously estimated at from 25 to 40 per cent. "Which looks bad," as Bro. Church puts it. Numerous are the devices for preventing, at least, a portion of this drain on the coal or wood-pile.

For marine boilers, of which I am now particularly speaking, almost all the plans so far tried are open to grave objections. Coverings of different kinds of cement, plaster, felt, etc., are objected to by our inspectors, as it prevents a proper inspection, and it don't pay to tear it off and put it on again every spring, or every time you want to get at the boiler, besides some of those coverings by holding the moisture from a leak, help corrosion. Tin laid on top of the shell of a boiler, like a horse-blanket, is the idea of Col. Ingersoll's "fellow in the dugout." It is the crude idea, and just needs development, same as Prof. Sweet's wrench. Marine boilers on the big lakes, anyhow, are closed in by a bulk-head, leaving space enough between the boiler and the bulkhead for getting around, clearing out, etc. Whether the boiler be on deck, or in the hold, this bulkhead acts as a protector, and keeps the average mate from piling coal-oil or nitro-glycerine on top of the boiler, besides preventing unnecessary injury to the boiler covering or boiler appendages. Now we have our boiler in position.

Tin is a good reflector of radiant heat, that is, it reflects back at an angle equal to the angle of incidence the non-luminous rays of heat that are being thrown out in all directions, especially from heated bodies. Now put on your hat and we will go and see the tinsmith; but we won't tell him we want an atmosphere and a reflector for our boiler. We'll tell him we want the boiler covered with tin. "What kind?" "Oh, I don't know!" After giving him this information, we get our pencil and make sundry sketches of something that might be as easily taken for the Brewers' Convention as a tin covering. The tinsmith looks on in admiration as we talk about air space, toes, lugs, sections, bands, etc., etc., until completely lost, he asks if we want it to-day, as he is very busy, and if we would make a sketch of what we want, he would do it to-morrow. I never yet saw a tinsmith that had not unlimited faith in to-morrow. Well! we think, possibly, we had better make a plan as the tinsmith is so stupid he can't understand anything, anyhow. So we go home and make a rough sketch of the covering.

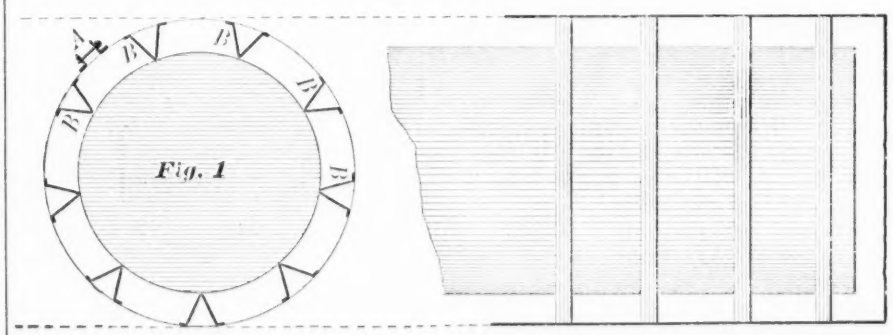


Fig. 2

Fig. 1 gives you an end view of the boiler, with a band on. The toes marked *B*, riveted to the band, are to keep the band so far away from the boiler to form an air space of from two to four inches, according to circumstances. The toes are placed close enough together to keep the band in shape, because when the lugs *A*, riveted to the bands are screwed together by a bolt pass-

ing through them, the band will flatten between the toes if they are too far apart. Make the band of ⅛″ band iron, two inches wide. Use IX charcoal tin, any convenient width. We use 22 inches wide, and place the bands around about the shell at a distance of 21 inches apart, from center to center, as shown in Fig. 3. This allows plenty of lap on each section of tin over the other. Put your first band as near the end of the shell as the row of rivets will allow, then having made a mammoth cover of a teapot in halves, large enough to cover the end, slip the rim on to the first band. Put the first section of tin on lapping the rim of the cover, and screw up. Those sections of tin are soldered; riveted seams are better; forming a strip 22 inches wide, by long enough to go around your boiler outside the bands, with two lugs—clips, I think, they are called by the trade—to screw them together with. Where the mud ports come, cut a hole in the tin, and put a rim with a small flange to it from the tin to and against the boiler. A few drops of solder will hold it. On account of so many doors in the front of the boiler, I do not consider it advisable to cover it; but where the sides come up to the front they must be closed in against the boiler. Keep the covering as tight as possible at the bottom, to prevent the cold air from rushing in, and at the top to prevent the hot air from rushing out.

The boiler now has an atmosphere of its own, and there is sure to be "fizzing" enough to keep the enclosed air sufficiently humid to get the full benefit of bad conduction; and we have a reflector that sends back a great portion of what heat passes through this atmosphere. A fire-box boiler, nine feet in diameter, seventeen feet long, was completely covered in this way; six feet six inches dome and all, for $75, two years ago. It paid for itself more than twice over during the first season of eight and a half months, and will last as long as it is used as it should be. One section can be removed altogether, or rolled up out of the way, without disturbing any of the others from their places, thus making it very convenient for inspection, repairs, or oiling in the fall, when laying up, besides keeping a cool firehold.

Now, I want to know something about twin-screws. Will somebody that knows, oblige a fellow that does'nt? Are they a success as regards economy of fuel and speed? What is the best way of dividing up the power, and what kind of screw ought to be used for a thirteen mile an hour boat—screw eleven feet six inches in diameter? I mean about what pitch for each screw—boat about 240 feet long and 37 feet beam; not to draw over 12 feet? Hoping to get some information on this matter, I remain,

Yours truly,
T. W. HUGO,
Steamer "City of Owen Sound,"
Canada.

BOILER BRACING.

Editor American Machinist:

In your issue of the 26th inst., Mr. Hoffman complains that in my letter in your issue of the 12th inst. I failed to show the T iron rafters under the shell, which add sufficient strength to the shell to prevent any trouble from the cause indicated by me.

My remarks on this subject (boiler bracing) have been aimed mainly against the injurious features of the present practice, for this reason: at that time there was no occasion for referring to the T iron rafters for strengthening the shell, since they are only suggested for future practice.

In my letter, in your issue of March 6th, in referring to these T iron rafters, which had been suggested by Mr. Hoffman and Mr. Schaubel, I used the following language: "Such a method of fastening the braces to the shell of the boiler would prove more fatally destructive than the more general practice of fastening with crowfeet, and would have the effect of forcing the lines of deterioration lower down on the straight sides of the fire box—a weaker part of the boiler."

The object of these proposed T iron rafters is to strengthen the shell to an extent to prevent deflection due to the pull or thrust of the vertical braces. Now it does not follow that because the shell has been strengthened to an extent to prevent deflection over the ends of the braces, that the forces acting through them has been destroyed or rendered further inoperative; on the contrary, these same forces are still active, and this strengthening of the shell will result in more effectually uniting and concentrating the aggregate thrust of these braces to the two sides of the fire box, directly at the ends of the T iron rafters, becoming a depressing strain upon the side sheets of the inside fire-box, and a tension strain upon the outside fire-box sheets. The strains thus concentrated upon the sides of the fire-box are increased to precisely the same extent to which the shell has been strengthened. The sides of the fire-box where the strains are thus concentrated is precisely where the stay-bolts are the least durable and most apt to give way, and is consequently the weakest part of the fire-box. Who, as an engineer, after due reflection, will venture to say that the aggregate strains resulting from these braces added to the effect of the steam pressure, may with impunity be concentrated upon this weakest part of the fire-box?

In connection with this reasoning let it not be overlooked that it relates to that part of the boiler where the widest differences of temperature prevail—difference of temperature which need only a rigid structure to enable it to rupture solid plates after only a few hours' exposure.

The allusion to the "crown bars" as the "Scrap heap" is unjust. Crown bars are not necessarily expensive in construction. They are less liable to derangement than any other device that has yet been produced for holding up the crown sheets. They do not interfere to a serious extent with the steaming qualities of the boiler. The greatest objection, perhaps, that can be offered against them is in connection with the deposit of scale upon the crown sheet. If we are to determine the value of any part of the locomotive boiler by the deposit of scale, we shall, I am afraid, have to consign the whole boiler to the "scrap heap." Let us be just: crown bars do not aid the formation of scale. The crown sheet, supported by crown bars, without vertical bracing, is the most accessible part of the boiler, and consequently the easiest cleaned. If we can secure the integrity of this important part of the boiler, with so simple and inexpensive a device, causing no greater inconvenience in the matter of cleaning than other parts of the boiler, we shall, I venture to say, have as favorable an arrangement as the present condition of the art of boiler-making will warrant us in expecting.

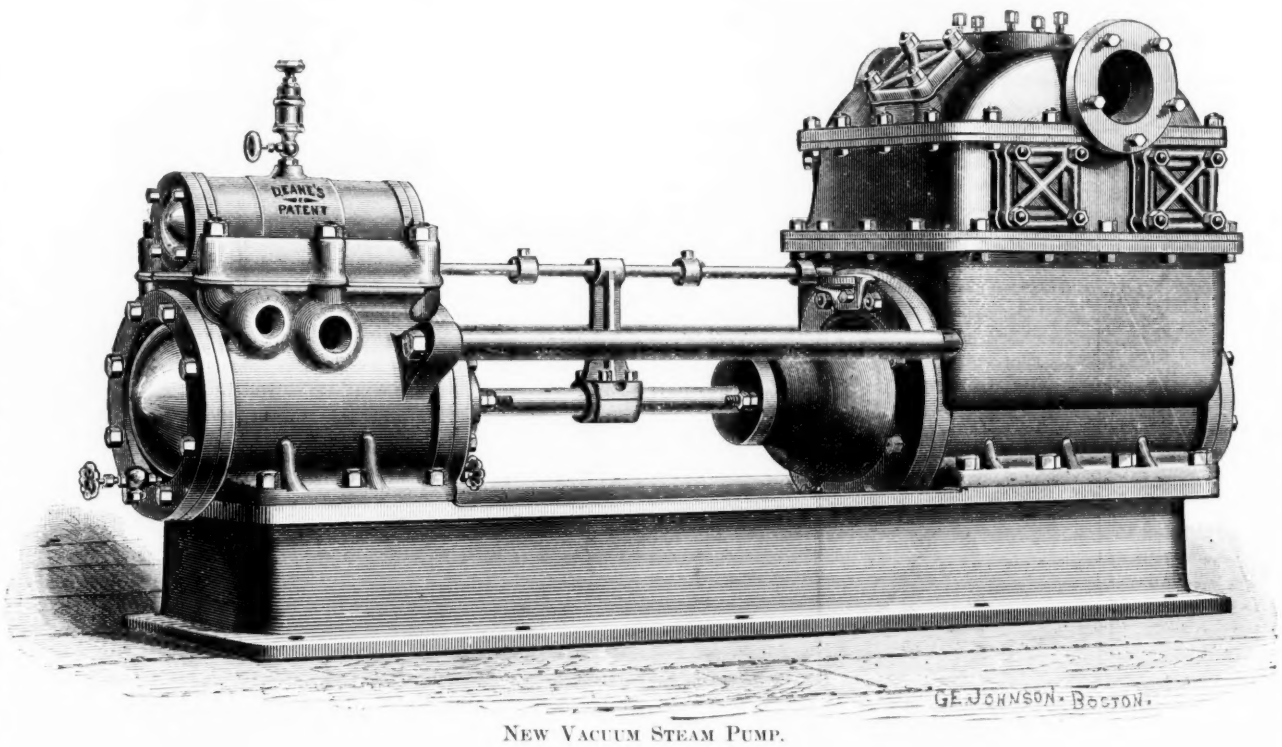
Thus far, Mr. Editor, my remarks on boiler bracing have aimed to expose the worst and most fatal cause of weakness in steam boilers—*unequal expansion*. Much may be said on this subject; many remarkable instances showing its destructive effects, have come under my notice during my business experience. Some of these, from time to time, with your kind permission, I will lay before your readers.

W. H. THOMPSON, M. E.
Cleveland, Ohio,
June 27th, 1880

New Vacuum Steam Pump.

Since the first successful attempt to use a direct acting vacuum pump, which was made a few years since, the manufacturers have been gradually adding one improvement and another until at the present time it would seem that there is little more to be desired. We illustrate herewith a new design of vacuum pump which is being built by the Deane Steam Pump Co., of Holyoke, Mass.; warerooms at 92 and 94 Liberty street, New York. The steam end or engine connected with this pump is of the usual Deane style used upon all pumps made by the firm referred to. It was illustrated by a detailed description in the AMERICAN MACHINIST for January 17, 1880. The air pump is constructed after designs which have been thoroughly tested in practice. The suction valves are attached in such a way that there is no possibility of dropping away from their seats through continual wear. Many different kinds of valves are used by pump manufacturers, but in this pump the rubber disc valve has been adopted as the one which possesses the most desirable features.

The air has free access to the air cylinder, so that there is no trouble caused by what is known as air pockets. The air cylinder is partly filled water, so that at the end of each stroke all the air is expelled and the space is filled with water. The piston rod of the air cylinder is provided with a water basin, which forms a packing, and prevents the admission of the smallest amount of air to the cylinder. A vacuum of 29½ inches of mercury has been attained and maintained by this pump which is a strong proof of the excellent manner in which the parts are fitted. All these parts are interchangeable and may be quickly duplicated. The piston rod is of composition. This style of pump is simple, compact and durable. It is much used in the West Indies, and in the glucose factories of this country. It is adapted to either the wet or dry process, and may be used economically in connection with steam engines for producing a vacuum. It is also designed for application to condensing apparatus and cooling tower when required. The combination of a vacuum and water pump has also been successfully made by the manufacturers of this pump, which is simple and efficient. These pumps, for special purposes, are proportioned so as to obtain the best and most economical results.



NEW VACUUM STEAM PUMP.

Safety of Sectional Boilers.

BY PROF. S. W. ROBINSON.

The so-called "water-tube" boilers have the advantage over the ordinary tubular, or "fire tube" boilers for safety in several respects, viz.:

1st. The steam drum of the former, which is the largest and most dangerous chamber of the boiler, is much smaller than the shell of the tubular boiler, and, when made of the same thickness of iron, will stand greater pressure in accordance with the inverse ratio of the diameter.

2d. At ordinary boiler pressure and temperature, a given volume of water is known to have from 15 to 20 times the explosive effect of an equal volume of steam.

3d. The steam drum of a water-tube boiler is less exposed to heat and corrosive action than the shell of a tubular boiler.

When a water-tube boiler is new the steam drum would probably rupture from internal pressure sooner than a tube; but even if the rupture should occur, the volume of the drum being only from a sixth to an eighth that of the tubular boiler for an equal power, far less is to be feared from it, even if under like circumstances at the instant of explosion. But as the steam drum has only steam, while the boiler shell is half full of hot water, the heat of which has such terrible effect in exploding, the relative effects of the explosions of a steam drum, and a tubular boiler, for boilers of equal power, would be about as 1 to $6 \times 20 \div 2 = 60$. That is, the old-fashioned boiler is about sixty times as destructive.

But we do not expect new boilers to explode. We expect some destroying agent to act upon them for a while first. In this case the tube will be more likely to fail than the steam drum, because the former will much more rapidly deteriorate. A water-tube boiler, failing by the disruption of a tube, is almost sure to be accompanied by no more serious effects than the kicking up of a dust. A tube laid open by the length of a foot, will so thoroughly relieve the adjacent portions of the tube from pressure as to arrest further ripping. But the water will rush from the other portions of the boiler as when a boiler is blowing off. The expenditure of the energy of the contents of the boiler will thus be prolonged; and with a corresponding reduction in intensity of action. A water-tube boiler thus blown up would not be moved from its place. The weakest tube will fail; the others remaining intact.

But when the tubular boiler-shell ruptures, the rate of weakening of the failing shell is much more rapid than the rate of reduction

of pressure; so that when a start is made, the whole shell is sure to be laid open in an instant. The water being at a temperature much above that for boiling in the atmosphere, the heat contained by the water above this limit, is instantly taken up in making steam. As this heat is distributed throughout the whole mass of water, steam is accordingly formed in myriads of bubbles in every cubic inch of that water, each inch expanding wonderfully in size, scattering water and steam everywhere. The volume thus developed will largely exceed that acquired by the steam which occupied the steam space just previous to explosion.

Rankine has calculated that solid hot water, at a temperature of about 800° to 1,000° Fahr., will explode with the violence of gunpowder. A building would therefore be blown up by the hot water itself, even if there be no steam present, at instant of rupture. The boiler shell is stock for the manufacture of missiles, and, altogether, the old form of boiler is very nearly a first-class bomb-shell, charged and primed.

When a tubular boiler has acquired some age, it cannot be otherwise than a thing of danger. If continued in use, its end will certainly be an explosion. The only remedy is in heading off the calamity by prompt inspection and condemnation. The rate of deterioration will, however, vary with the quality of water used, with the form of shell, the draught, fuel, setting, care, etc., so that the life of one such boiler may be several times that of another.

But, as above noted, the water-tube boiler will be most likely to fail in the tube, the size of which is too small to cause serious damage. Though the life of parts of this boiler may not be greater, if as great, as that of the other form, yet, as the failure of a part will simply alarm, and not destroy, it will not call so loudly for inspection.

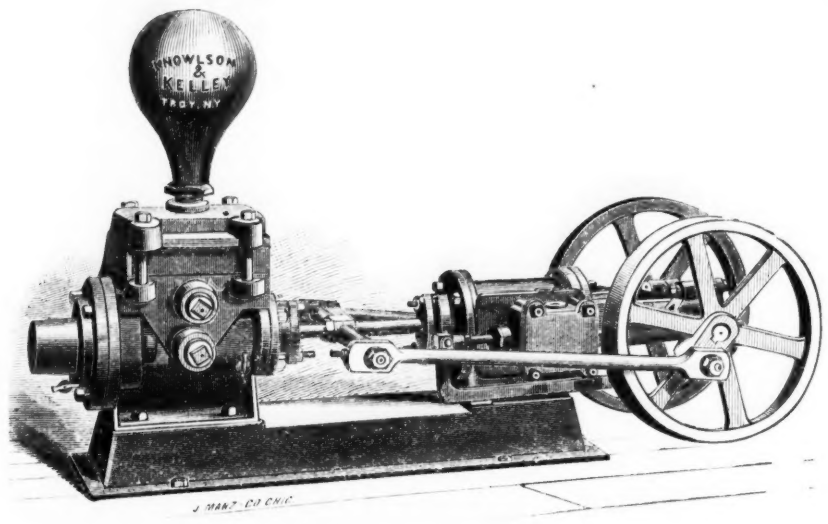
In my own experience, one first-class characteristic water tube boiler explosion is noted. Exactly when it occurred no one knew. While passing one day, my attention was called to the dripping of water from the tubes into the fire; the boiler being on duty, and nothing serious expected. But when the matter was investigated, a tube was found ruptured for a length of three or four inches, but not to cause a gaping opening.

Sectional boilers having somewhat large water chambers, or compartments, will be liable to cause greater disturbance from the rupture of them than those having simply tubes, or other small water spaces, and a steam drum. This is owing to the greater explosive power of the water contained in the large water compartment as compared with the steam drum.

Of course no boiler exists that can be said to be *perfectly*, or *absolutely* safe. In the range of possibilities, several tubes might be shot off simultaneously; several nearly equally weak, being disturbed about a failing one in proximity, might *possibly* receive that slight disturbance which would be the "straw to break the camel's back." But for many sectional boilers, the construction which might be put upon the above "perfectly," or "absolutely," might be about like ten thousand men constantly in a building along with such safety boiler, only to die by being blown to death by the boiler some day. Sharp life insurance companies would take their risks at a discount.

Double Acting Ram Pumps.

The variety of steam pumps now being manufactured is something surprising. They are made with special adaptations to about every possible kind of service presenting every peculiarity of style. On this page is shown a cut of an improved double acting ram pump manufactured by Knowlson & Kelley, Troy, N. Y. It is designed for feeding boilers, also for fire purposes, mines and breweries, and for wrecking services. It is a plunger pump, requires no packing in the water cylinder, and will pump hot or cold water without injury to packing. This pump is particularly efficacious in dirty or



DOUBLE-ACTING RAM PUMP.

sandy water, and is calculated for great durability. The valve motion is readily accessible, and is easy to repair and pack.

New England Manufacturers' and Mechanics' Institute.

This enterprise, several times noticed in these columns, is progressing very favorably. The following circular explains its aims and objects for the information of the public:

BOSTON, June 15, 1880.

This organization is a joint stock corporation formed under the corporation laws of Massachusetts, with a capital stock of one hundred thousand dollars divided into four thousand shares, of twenty-five dollars each.

The first business of the Institute is to erect an Exposition building, in which to hold annual fairs of the manufacturing, mechanical and other products of New England. Organizations of this kind have been formed in various parts of the country, and have

FIG. 1.

been, not only a great benefit to the communities where they are located, by stimulating manufacturers and mechanics to excel in the quality and styles of goods made by them, but, have also proved to be, without exception, a financial success. The great Expositions held annually at Cincinnati, St. Louis,

FIG. 3

and Chicago, are examples of the truth of this statement.

The Interstate fair, held annually at Chicago, is not only a benefit to that city by bringing hundreds of thousands of people to the city every year, but is of vast importance to the whole Northwest. By these fairs the people are brought together to see and examine the great improvements made, from year to year, in machinery and manufactured goods; this association has paid a dividend every year of seven per cent. on two hundred and fifty thousand dollars, and sometimes more; and accumulated a capital of four hundred and fifty thousand dollars besides; (while one hundred and seventy-five thousand dollars is all that was ever paid in by the stockholders.)

A similar success has attented the Cincinnati Exposition. In 1879, they held their seventh annual exposition, which, their report says, had exhibitors from twenty-four States, and was visited by 422,957 persons.

The St. Louis fairs have sometimes had as many as eighty thousand visitors in a single day. With these facts before us, it is a matter of surprise that New England has not before this taken steps to maintain her position and show to the world what she can do in this direction. More than seventy five per cent. of all the population of New England are dependent upon manufacturing and mechanical industries; and this per cent. must increase, rather than diminish, in the future. In fact, the future of New England depends upon her being able to maintain her position in these industries; and one of the most effective means to this end is by making an annual exposition which shall worthily represent her and attract the whole world. New England's *motto* should be to *excel* in quality in every branch of her manufacturing and mechanical business.

One fact which should be kept in mind is that our railroad facilities are now such that we can ship our goods at as low rates, from Boston as from New York, to the great West; and why should not we use all honorable means to induce the purchasers to come to Boston to buy our goods; and these annual expositions will offer an inducement in this direction, and afford an opportunity for manufacturers to meet their customers as often as once a year. A large portion of the stock in the Institute is already distributed, being taken in amounts of one hundred dollars (four shares) by manufacturers, mechanics and others interested. The balance of the stock is guaranteed, and is in the hands of the executive committee, and is by them offered for sale, believing that every manufacturer and mechanic in New England should be interested in this great enterprise, and have an oportunity to become interested in its management. The By-laws provide for an executive committee of not more than twenty-five, or less than fifteen in number, to be elected by the stockholders annually. And a sub committee of five to each of the New England States. Six and one-third acres of land have been leased for twenty years, with the privilege of purchasing or extending the lease to thirty years. This land is located on Huntington avenue, one of the great avenues in Boston, and is so situated that cars can be run into the building from the Providence Railroad without any expense to the Institute. Money is already appropriated for plans of a building, and work will be commenced at an early day.

Anything short of making this enterprise a grand success, means a decay of that vitality which has been characteristic of New England people.

Any information desired may be obtained by addressing R. C. Graves, 29 Oliver St., Boston, Mass.

The Civil Engineers' Club of the Northwest has metamorphosed into the Western Society of Engineers.

Empire Portable Forges.

The use of portable forges is extending very rapidly. With a few tools as accessories, they each may be considered a portable blacksmith shop. One of the most successful forms of portable forge, operated without belts or bellows or any perishable attachment, is the Empire, manufactured at Troy, N. Y., by the Empire Portable Forge Co. The cut designated Fig. 1 represents a style designed for indoor or shop work, of which four sizes are made. They are made of cast iron, with a hood shutting up closely to confine the sparks, and to which a stove-pipe may be attached, making it as safe as a stove. Fig. 2 represents a small cheap forge for light work, suitable for mounting on a work bench. Fig. 3 represents a class of wrought iron portable forges, which are largely used by boiler makers, bridge builders, and for general railroad repairs. The Company make twenty-five sizes of Empire Forges.

Korting's Jet Condenser.

The object of a jet condenser is the same as that of the air-pump condenser largely used, viz.: to create a vacuum by condensing steam. According to the degree of the

FIG. 2.

completeness and quickness of the condensation, the effect is more or less favorable. We present on this page an engraving of Korting's Jet Condenser for low and high pressure stationary engines and steam pumps. One of these condensers of proper size, it is claimed, will give a vacuum as good as an air pump condenser, or even better without the expenditure of power, which the working of the air pump requires. In small engines, worked with high pressure steam, the necessary power to drive the air-pumps nearly equals the power gained by the condenser.

These jet condensers require no air pump, consequently involve no loss of power and are as well applicable to the smallest engines as to large ones. The consumption of water is the same as that required by the air pump condenser.

The amount of condensing water required, is about 25 times the amount of water evaporated for the use of the engine; and it must flow to the condenser under a constant pressure, corresponding to a head of water not less than twelve feet.

If there is no natural reservoir or any other supply, from which a regular flow of water may be drawn, it becomes necessary to place a pump of sufficient size to supply the amount of water and force it to the required height; but in that case it is always to be recommended to let the pump discharge into a small reservoir from which the condenser is fed.

In connecting this condenser, it is placed vertical, and, if possible, below the cylinder of the engine. The water supply-pipe is made as straight as possible. If the water supply-pipe is very long, its diameter has to be increased in proportion.

This jet condenser is sold by A. Aller, general agency of Schutte & Goehring's manufactures, 109 Liberty St., New York.

Instructions to Boiler Attendants Issued by the Manchester (England) Steam Users' Association.

Getting up Steam.—Warm the boiler gradually. Do not get up steam from cold water in less than six hours. If possible, light the fires over night. Nothing turns a new boiler into an old one sooner than getting up steam too quickly. It hogs the furnace tubes, leads to grooving, strains the end plates, and sometimes rips the ring-seams of rivets at the bottom of the shell.

Firing.—Fire regularly. After firing, open the ventilating grid in the door for a minute or so. Keep the bars covered right up to the bridge. Keep as thick a fire as the quality of the coal will allow. Do not rouse the fire with a rake. Should the coal cake together, run a slicer in on the top of the bars and gently break up the burning mass. It has been found by repeated trials that under ordinarily fair conditions no smoke need be made with careful hand-firing.

Cleaning Fires and Slacking Ashes.—Clean the fires as often as the clinker renders it necessary. Do not slack the clinkers and ashes on the flooring plates in front of the boiler, but draw them directly into an iron barrow and wheel them away. Slacking ashes on the flooring plates corrodes the front of the boiler at the flat end plate, and also at the bottom of the shell where resting on the front cross wall.

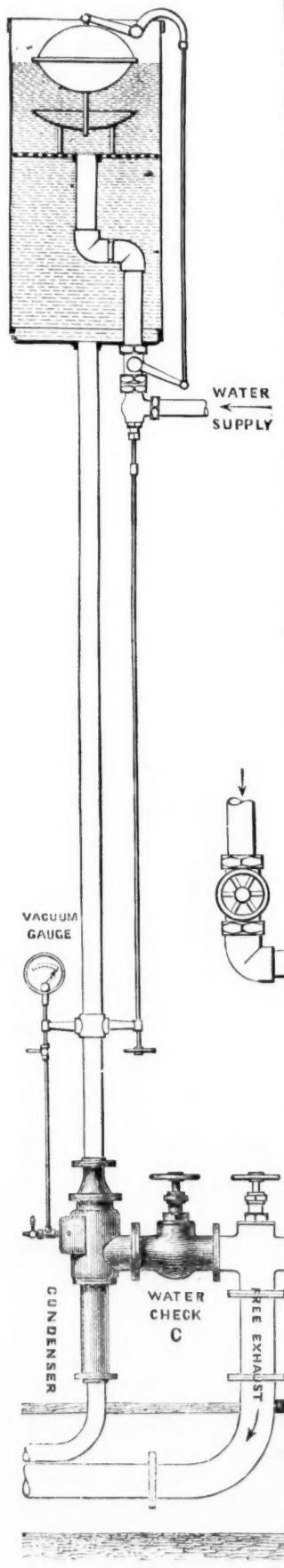
Feed Water Supply.—Set the feed valve so as to give a constant supply, and keep the water up to the height indicated by the water-level pointer. There is no economy in keeping a great depth of water over the furnace crowns, while the steam space is reduced thereby, and thus the boiler rendered more liable to prime. Nor is there any economy in keeping a very little water over the furnace crowns, while the furnaces are thereby rendered more liable to be laid bare.

Glass Water Gauges and Floats. — Blow through the test-tap at the bottom of the gauge hourly, as well as through the tap in the bottom neck, and the tap in the top neck twice daily These taps should be blown through more frequently when the water is sedimentary, and whenever the movement of the water in the glass is at all sluggish. Should either of the thoroughfares become choked, clean them out with a wire. Work the floats up and down by hand three or four times a day to see that they are quite free. Always test the glass water-gauges and the floats thoroughly the first thing in the morning before firing up It does not follow that there is plenty of water in the boilers because there is plenty of water in the gauge-glass. The passages may be choked. Also empty gauge-glasses are sometimes mistaken for full ones, and explosions have resulted therefrom. Hence the importance of blowing through the test-taps frequently.

Blowing-out Taps and Scum Taps.—Open the blow-out tap in the morning before the engine is started, and at dinner time when the engine is at rest. Open the scum tap when the engine is running, before breakfast, before dinner, and after dinner. If the water be sedimentary, run down half an inch of water at each blowing. If not sedimentary, merely turn the taps round. See that the water is at the height indicated by the water-level pointer at the time of opening the scum tap. Do not neglect blowing out for a single day, even though anti-incrustation compositions are put into the boiler. Water should be blown from the bottom of the boiler when steam is not being drawn off, so that the water may be at rest and the sediment have an opportunity of settling. Water should be blown from the surface when steam is being drawn off, so that the water may be in ebullition and the scum floating on the top. If the water be below the pointer, the scum tap will blow steam; if above the pointer, the scummer will miss the scum.

Safety Valves.—Lift each safety valve by hand in the morning before setting to work, to see that it is free. If there is a low-water safety valve, test it occasionally by lowering the water level to see that the valve begins to blow at the right point. When the boiler is laid off, examine the float and lever, and see that they are free and that they give the valve the full rise. If safety valves are allowed to go to sleep, they may get set fast.

Shortness of Water.—In case the boiler should be found to be short of water, draw the fires, if practicable, and draw them quickly, beginning at the front. In some cases it may be more convenient to smother the fire with ashes, or with anything else ready to hand. If the fires are not drawn, leave the furnace doors open, turn on the feed, lower the dampers, shut down the stop valve, if the boiler be one of a series, and relieve the weight on the safety valves, so as to blow off the steam. Warn passers by front of the boiler. Drawing the fires must be done with discretion, and ought not to be attempted if the furnace crowns have begun to bulge out of shape. At Clay Cross, near Chesterfield, on Thursday, January 14, 1869, as the attendant was in the act of drawing the fire from a furnace overheated from shortness of water, the crown rent, when the torrent of steam and hot water that ensued blew him backwards to a distance of twenty-five yards, rake in hand, and killed him on the spot.



KORTING'S JET CONDENSER.—SEE PAGE 6.

Use of Anti-incrustation Compositions.—Do not use any of these without the consent of the M. S. U. A. If used, never introduce them in heavy charges at the manhole or safety valve, but in small daily quantities along with the feed-water. Many furnace crowns have been overheated and bulged out of shape through the use of anti-incrustation composition, and in some cases explosions have resulted.

Emptying the Boiler.—Do not empty the boiler under steam pressure, but cool it down with the water in; then open the blow-out tap and let the water pour out. To quicken the cooling, the damper may be left open and the steam blown off through the safety valves. Do not on any account dash cold water on to the hot plates. But, in cases of emergency, pour cold water in before the hot water is let out, and mix the two together so as to cool the boiler down gradually and generally, and not suddenly and locally. If a boiler is blown off under steam pressure, the plates and brickwork are left hot. The hot plates harden the scale, and the hot brick work hurts the boiler. Cold water dashed on to hot plates will cause severe straining by local contraction, sometimes sufficient to fracture the seams.

Cleaning out the Boiler.—Clean out the boiler at least every two months, and oftener if the water be sedimentary. Remove all the scale and sediment as well as the flue dust and soot. Show the scale and sediment to the manager. Pass through the flues, and see not only that all the soot and flue dust has been removed, but that the plates have been well brushed. Also see whether the flues are damp or dry, and, if damp, find out the cause. Further, see that the thoroughfares in the glass water-guages and in the blow-out elbow pipe, as well as the thoroughfares and the perforations in the internal feed dispersion pipe and the scum pipe, are free. Take the feed pipe and scum troughs out of the boiler if necessary to clean them thoroughly. Take the taps and the feed valve to pieces, examine, clean and grease them, and if necessary grind them with a little fine sand. Examine the fusible plugs. Do not put any blocks under the pipes in the hearth pit. Putting blocks under the pipes in the hearth pit robs them of their spring, strains them, and sometimes breaks them.

Preparation for Entire Examination.—Have the boiler cooled and carefully cleaned out as explained above. Show both scale and sediment to the inspector, as well as the old cap of the fusible plug, and tell him of any defects that may have manifested themselves in working, and of any repairs or alterations that may have been made since the last examination. Unless a boiler be suitably prepared, a satisfactory entire examination cannot be made. Inspectors are sent at considerable expense to make entire examinations, and it is a great disappointment when their visits are wasted from want of preparation. The Association is always happy to afford information to boiler attendants by means of its printed monthly reports, and to help them in the discharge of their duties, and expects them in return to do all they can to promote a thoroughly sound inspection of the boilers under their charge.

Fusible Plugs.—Keep these free from soot on the fire side and from incrustation on the water side. Change the fusible metal once every year, at the time of preparing for the M. S. U. A. Annual Entire Examination. If fusible plugs are allowed to become incrusted, or if the metal be worked too long, they become useless, and many furnace crowns have rent from shortness of water, even though fitted with fusible plugs.

General Keeping of Boiler.—Polish up the brass and other bright work in the fittings. Sweep up the flooring plate frequently. Keep ashes and water out of the hearth pit below the flooring plates. Keep the space on the top of the boiler free, and brush it down once or twice a week. Take a pleasure in keeping the boiler and the boiler house clean and bright, and in preventing smoke.

A supplementary glass water-gauge, fixed low enough to show if the furnace crowns were laid bare, would help a boiler attendant in case of shortness of water, to determine whether it was safe to draw the fires or not.

The following note was appended to the above directions: Shortness of water generally arises from neglect of the boiler attendant, and ought not to occur. It is by no means easy to give precise instructions as to what should be done to put things right when shortness of water has occurred, so as to meet every case. Drawing the fires when the water is out of sight must always be a matter of more or less risk, as there is a difficulty in determining how far and for how long a time the furnace crowns have been laid bare. If it is known that the water has only just passed out of sight, say, from the sticking fast of the blow-out tap when attempting to shut it, the fires might be drawn with safety. But if an empty gauge-glass has been mistaken for a full one, and the boiler has been worked on in this state for some time, the case will be different. Again, there would be more risk in drawing the fires from a plain furnace tube, or from one made of ordinary plates, than from one strengthened with encircling rings and made of ductile steel, or of iron equal to Low Moor or Bowling. In the M S.U.A Museum there is a photograph of a pair of steel furnaces, strengthened with flanged seams, which have bulged down to the fire-bars through overheating, from shortness of water, without rending. Also, there is a pair of furnaces made of Low Moor iron and strengthened with flange seams, which, though seriously overheated, through shortness of water, have rent for a limited extent only in the neighborhood of the flanged joint, the opening formed measuring about 7in in length by 1in. at the widest part. On the other hand, there are in the museum two furnaces from different boilers—neither of which is strengthened with encircling hoops, nor made of ductile steel or of Low Moor or Bowling iron, both of which have rent right across, forming an opening 13in. wide in one case and 6¼in. in the other. Thus it will be seen it is difficult to give precise instructions to suit all circumstances. A fire may be safely drawn in one case and not in another. Discretion must be exercised. It should be borne in mind that the rupture of a furnace crown is not only dangerous to the fireman, but in many cases to those outside the works, as the torrent of steam and hot water that ensues frequently carries away the furnace mountings, along with any brickwork lying in its course, and scattering the *debris* like so much grape shot, severely injures, and sometimes kills persons on their own premises. Thus boiler attendants must remember that shortness of water endangers other persons' lives as well as their own. The best advice the M.S.U.A. can give to boiler attendants with regard to shortness of water is—Do not let it occur. Keep a sharp look-out on the water-gauge.

AMERICAN MACHINIST

PUBLISHED WEEKLY

BY

American Machinist Publishing Co.

HORACE B. MILLER, Prest.

JACKSON BAILEY, Vice-Prest.

LYCURGUS B. MOORE, Treas. and Sec.

96 Fulton Street, New York.

JACKSON BAILEY, Editor. HORACE B. MILLER, Business Manager.

LEWIS F. LYNE, Mechanical Engineer.

The American News Company,

Publishers' Agents, New York.

The International News Company,

(Formerly the Wilmer & Rogers News Co.)

11 BOUVERIE STREET, (Fleet St.) LONDON, ENG.

Will receive subscriptions for the AMERICAN MACHINIST at 17 shillings per annum, postage prepaid.

DEALERS SUPPLIED BY

The New York News Company, New York.
The National News Company, New York.
The New England News Company, Boston, Mass.
The Central News Company, Philadelphia, Pa.
The Western News Company, Chicago, Ill.
The St. Louis Book and News Co., St. Louis, Mo.
The Cincinnati News Company, Cincinnati, Ohio.
The Detroit News Company, Detroit, Mich.
The Pittsburgh Book and News Co., Pittsburgh, Pa.
The Baltimore News Company, Baltimore, Md.
The Rhode Island News Co., Providence, R. I.
The San Francisco News Co., San Francisco, Cal.
The Brooklyn News Company, Brooklyn, L. I.
The Newark News Company, Newark, N. J.
The Northern News Company, Troy, N. Y.
The Albany News Company, Albany, N. Y.
The Washington News Co., Washington, D. C.
The Toronto News Co., Toronto, Ontario, Canada.
The Toronto News Co., Clifton Branch, Clifton, Ontario, Canada.

SUBSCRIPTION.

$3.00 a year, in advance, postage prepaid in the United States and Canada.

$4.00 to Foreign Countries, postage prepaid.

ADVERTISING.

Transient, 30c. per line, (12 lines one inch.)

"Business Specials," 40c. a line.

EDITORIAL ANNOUNCEMENTS.

☞ *Positively we will neither publish anything in our reading columns for pay or in consideration of advertising patronage. Those who wish to recommend their wares to our readers can do so as fully as they choose in our advertising columns, but our editorial opinions are not for sale. We give no premiums to secure either subscribers or advertisers.*

☞ *Every correspondent, in order to insure attention, should give his full name and address, not for publication, but as a guarantee of good faith.*

☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

☞ *Subscribers who fail to receive their paper promptly will please notify us at once.*

☞ Entered at the Post Office at New York, N. Y., as second class mail matter.

NEW YORK, JULY 24, 1880.

CONTENTS.

	PAGE.
New Emery Grinding and Boring Machinery	1
Practical Draughting-Gearing.—T. P. Pemberton.	1
New Horizontal Steam Engine	2
Extracts from Chordal's Letters	2
New Bookbinders' Sawing Machine	3
Industrial Education	3
Holyoke Turbine Tests	3
Marking Machinery.—Egbert P. Watson	4
Oil Holes	4
Letters from Practical Men	4
New Vacuum Steam Pump	5
Safety of Sectional Boilers.—Prof. S. W. Robinson	5
Double Acting Ram Pumps	6
New England Manufacturers' and Mechanics' Institute	6
Empire Portable Forges	6
Korting's Jet Condenser	6
Instruction to Boiler Attendants Issued by the Manchester (Eng.) Steam Users' Association	7
Condition of the Iron Trade	8
Improper Steam Engine Tests	8
Incorporated Frauds	8
Instructions to Engineers and Boiler Attendants.	9
Questions and Answers	9
Manufactures	9
Machinists' and Engineers' Supplies	10
Iron Review	10
Metal Review	10

Condition of the Iron Trade.

The condition of the iron trade at the present time is peculiar. A few months ago, when prices were advanced over 100 per cent., very extensive contracts for iron were placed abroad for importation. The long depression in business and the extremely low prices of iron in our markets had resulted in almost an entire stoppage of importations, which was regarded by American producers as gratifying in the highest degree. Consumers had settled upon the use of American pig, bar, and railroad iron and steel, to the exclusion of Scotch and English makes, with entire satisfaction, and British iron-masters had about consoled themselves, without any buoyant hopes of recovering their lost trade on this side of the Atlantic. They might reduce their prices, but found it impossible, without serious loss, to name prices that would induce our mills and foundries to change from brands of raw metal, the treatment of which was familiar to all the workmen, to essentially different brands, requiring different treatment, in order to insure the best results. It needed extra inducements, in the way of lower prices, to effect such a change, but, to a large extent, it has been accomplished since the astonishing advances of last fall. American iron makers, by making inordinate advances in their asking prices, opened the door for extensive foreign importations, which, under stimulus of a heavy consumption, were entered into with alacrity. Many consumers gradually acquired the necessary knowledge of manipulating foreign irons, and were induced to make use of them, to the exclusion of home brands. Here is where the trouble lies. Idle furnaces started up in every part of the country, and stocks, at one time hardly sufficient to supply the demand, began to accumulate. The revival of the iron trade in Great Britain was not sustained, and prices had to be reduced in our markets. But every reduction has been met by foreign iron makers, who have good reason to rejoice over the securing of so many good customers in this country. The sales of Scotch pig iron in small lots for early consumption in New York city, are today far in excess of sales of American pig for the same class of trade. Some brands of Scotch iron are sold as low as best American anthracite iron. Meanwhile quite a number of blast furnaces in Pennsylvania and the West have been obliged to let their fires die out, and make efforts to dispose of their surplus stock.

The best features of the market may be observed in a continued, extensive melting of iron, and a reduction in the amount of large contracts placed abroad. But it is not the work of a few weeks or a few months to reduce foreign importations to their contracted volume of one year ago.

Improper Steam Engine Tests.

The exhibitors of steam engines at the different exhibitions which have taken place in this country seem to have fallen into a grievous error.

To illustrate: A certain steam engine builder takes a notion that he would like to exhibit an engine, and have it tested at a certain exhibition which is to take place in a few months. He accordingly sets his men to work and completes his engine, doing the work in a very superior manner; but in the meantime does not make an application for space in the coming exhibition, but keeps putting it off until a few days, or possibly a week, before the time for the exhibition to open. Then he seizes upon a certain locality and, as soon as the papers are properly made out, rushes for a mason and has a foundation built. If the ground is rocky so much the better, but in most cases it is soft and yielding, so that to get a proper foundation a few piles should be driven and timbers placed upon the top before the attempt is made to build up the foundation. As before mentioned, these precautions are seldom or never observed, but, with the excuse that time will not permit, a foundation is put down which is simply an apology for one, and which begins to settle from the day it is completed. As a material of which to build the foundation referred to stone is seldom used, and bricks are generally the first thing that can be procured. The mortar is hastily prepared as cement is considered too expensive. After the foundation is completed, and before the mortar has had time to set the engine is placed upon it, and the anchor bolts tightened so that, as a result of this severe test, the foundation is pulled all apart, and by an inspection is found to be full of cracks. When the engine is first started it runs beautifully as any piece of superior machinery ought to, but after a few days the foundation begins to yield. The bearings begin to heat, and an inspection to ascertain the cause, reveals that the outboard pillow block has settled about a quarter of an inch. The bearing is again leveled, and the engine started, when it is found that the foundation moves, or works with every stroke of the engine, and if there are any places to apply timbers shores are placed about the foundation, with the intention of strengthening it, but, as every practical man knows, without success. The complication of difficulties increase day after day until the engine has to be stopped in order to set things to rights. The facts of the case are that a first-class engine has been placed upon a miserable foundation, which would not be tolerated in a factory or any place where the engine was designed to remain permanently. The idea appears ridiculous when the facts are considered that the engine in question was built for exhibition, upon which a thorough test is to be made which is to establish the reputation of the engine or condemn it. Many an engine builder has had a severe task to afterwards overcome the public prejudices, which have arisen through the want of proper consideration in putting down a proper foundation for his engine. We would recommend that all exhibitors of steam engines who desire a perfectly satisfactory test, which will develop the qualities of their engine, in reliable manner, to put down a foundation a month or six weeks before the engine is placed upon it. The bricks should be laid in good cement, and if the ground requires piling it should be done by all means, and the foundation should be so thoroughly bound together that one part cannot settle without the whole moving. It is a common practice to make the foundation for the outboard pillow block entirely separate from the main foundation, and as a result it, in a short time, will begin to settle or begin to work so that the bearings will begin to heat so that they will have to be loosened. This, of course, will cause a very disagreeable pounding which may be observed in most of the engines on exhibition at a fair. Another very serious difficulty is the impossibility of obtaining dry steam, from the fact that the boiler is placed too far away from the engine. Under these circumstances the engine works so much water that the cylinder cocks have to be left open all the time unless the valves are so arranged as to dispense with cylinder cocks.

We consider it a very unwise course to attempt to test an engine under these circumstances as the expert cannot reasonably hope for any very encouraging results under the conditions named. A far more creditable and reliable test could be made from one of the same class of engines that has been running upon a good foundation in some factory or shop, and where sufficient time has elapsed, before making the test, to allow the bearings to become thoroughly adapted to the work; also where good dry steam can be procured. Notwithstanding the unfavorable conditions named, numbers of engines are tested every year under these very circumstances by men who ought to know better, and the results taken as conclusive and reliable evidence either for or against the engine tested.

We hope a reformation in this direction will be begun, so that tests made in the future may be rendered of greater value to engineers and manufacturers.

An interesting article by Prof. Robinson, of the Ohio State University, appears on page 5.

Incorporated Frauds.

The gullibility of a large portion of that great body of people known as "the public" is amazing. The possession of common sense is supposed to be universal, but when it comes to a crucial test, a wonderful deficiency in this valuable quality is developed in spots. If this were otherwise, at least four-fifths of the million dollar mining companies now feasting upon the credulity of unsuspecting investors in their stocks would go to the wall. But there is no diminution of the gullible class. A fresh brood of easily plucked "speculators" with means to invest seems to rise up every year. There are honest mining companies as well as honest manufacturing companies, but it needs but a little investigation to show that the larger portion of the former have no substantial foundation to rest upon. In a recent letter from the office of Secretary of State, Albany, N. Y., we are informed that "this office is receiving from five to fifteen articles of incorporation per day, mainly silver mining companies." As the organization of a gold or silver mining company with less than half a million dollars "capital stock" is something very unusual, and as there is a prolific crowd of such mining companies already organized, a cautious individual will stop to think, before buying stock, whether the silver to float all these corporations is not more likely to be taken from the pockets of investors than from the bowels of the earth.

Unless the argentiferous rocks and soil yield treasure in greater abundance than the most sanguine mineralogists have dared to predict, most of these fabulously stocked companies will be as barren of dividends as Sahara of cabbages and potatoes. Yet the glittering bait is eagerly seized and thousands who would shrink in moral horror from risking any part of their fortunes in a faro bank complacently part with their surplus dollars, in the fond expectation of gathering an increase from a gambling institution every bit as bad, although legalized by an act of incorporation. The State, however, is not the responsible party. Officers of the government can not refuse to grant a charter of incorporation when application is made according to law. They can not exercise the power of an inquisition over the business prospects of a concern applying for a certificate to form a stock company.

Mining companies are not alone in schemes for rapid enrichment by the sale of stock. Companies are often started to develop some wonderful motor that is to supersede or revolutionize steam power. The fact that every one of these ventures have heretofore come to naught does not seem to have any weight with the class of people who come forward with their well-filled pocket books to participate in the prospective astonishing profits. The Keely Motor Company still exists, and its stock has a marketable value. Meanwhile Mr. Keely, who was a man of very moderate means, wears a diamond pin upon his shirt front, and drives a span of fast trotters, while the expectant stockholders wait for long-promised results.

Last spring, a stock company was started in this city upon an alleged invention, or discovery, that the injection of cold air into the cylinder of a steam engine, while at work, would greatly increase its effective power, without the consumption of any extra fuel. This discovery was heralded by some of the daily papers as one of the greatest mechanical achievements of the age. Reporters were sent to witness the operation of an engine fitted with the air injecting attachment, and wrote glowing accounts of its operation and wonderful saving of fuel. About that time one of the contributors of the AMERICAN MACHINIST, a well known expert in steam engineering, was requested by outside parties to make a test of an engine fitted with the air feeding device, and communicate the results. He made a test with an indicator, and was surprised to find an apparent large increase of power by the injection of cold air into the cylinder. But instead of jumping at conclusions, he quietly made preparations to test not only the engine but its source of power, and according-

ly asked the privilege of testing the boiler, engine, and all appurtenances, commencing by weighing the coal before feeding it into the furnace. This request was flatly and decidedly refused, the proprietors of the wonderful fuel-economizer not desiring to have any test of that kind undertaken. They were not prepared to entertain such a proposition. After making some further inquiries the expert became fully convinced that the project was a humbug and so expressed himself. But the Cloud Engine Co. was started with "capital $5,000,000," and a good supply of blank stock certificates printed. Those who wish to invest in this stock will probably have an opportunity to do so. As near as we can learn the strongest basis the company has to rest upon, is a notice given in a daily paper of the wonderful results witnessed by the reporter who saw an engine run fitted with the Cloud attachment. Before dismissing this subject we must refer to an incident illustrating the accuracy of some reports of mechanical phenomena, as published in daily newspapers. Some time since Mr. T. A. Edison, of Menlo Park, mentioned to us the visit of a reporter of a leading New York daily paper to his laboratory when the electric light was on exhibition. They were sharpening some tools upon an emery wheel, and sparks of fire were flying off. The next morning's paper contained a brilliant account of the operation of one of the dynamo electric machines, throwing off sparks of fire in a continuous shower, presenting a beautiful and attractive appearance. The Brown Engine was glowingly referred to as the "generator" of electricity.

Instructions to Engineers and Boiler Attendants.

Our readers will observe elsewhere in the columns of this issue certain instructions to boiler attendants which, as a whole, are good, and will doubtless be found of service to engineers and steam boiler attendants, as they have been largely adopted in England. But there are certain parts of those instructions with which we do not agree, one of which is as follows: "Keep the grate bars covered right up to the bridge. Keep as thick fire as the quality of the coal will allow." We believe this to be entirely wrong. We once knew an engineer who came from the other side of the water who had the same idea of firing. Upon starting the fire he used to fill the furnace up even with the top of the bridge wall. It used to take him from two to two-and-a-half hours to get steam from warm water, so as to be able to get to work. This engineer complained that he could not make steam, and as a result had to work very hard, and finally the proprietors of the factory put an addition of ten feet upon the top of the brick chimney, without any appreciable improvement. This engineer also melted down several sets of grate bars.

One day, the engineer had to go away. He left the engine in charge of a boy who was but fourteen years of age, but who had been about the engine long enough to understand it pretty well. After the engineer had gone the boy examined the fires, and began to use the slice bar pretty freely. The usual steam pressure carried was 60 lbs. per square inch, and it was generally hard to get above that pressure, although the safety valve was set to blow off at 80 lbs.

The boy did not put on any more coal, but every few minutes would use the slice bar, and the fires, at first dead, began to burn more freely until they were from four to six inches thick. The pointer on the steam gauge began to move forward, until the safety valve began to rise, and it became necessary to open the furnace doors. The proprietor came into the engine room to see what was the matter, and saw the boy sitting upon a stool with a smile upon his face, the furnace doors open about two inches, and everything booming. When asked how it was that he could get so much steam with so little labor and less coal, he said in a simple way: "I knew I could do it with thin fires." Here then was the secret. With a thick fire the air could not get through and consequently there was a back draft, and the heat which could not escape settled upon the grate bars melting them down. We therefore say, *work a fire as thin as the quality of the coal will allow, being careful not to go to extremes.*

There is little or no smoke from a thin fire, as the combustion is more nearly perfect.

Another portion of the instructions referred to reads as follows:

"In case the boiler should be found to be short of water, draw the fires if practicable, and draw them quickly, beginning at the front. In some cases it may be more convenient to smother the fires with ashes, or with anything else ready to hand. If the fires are not drawn, leave the furnace doors open, turn on the feed, lower the dampers, shut down the stop valve, if the boiler be one of a series, and relieve the weight on the safety valves so as to blow off the steam. Warn passers by in front of the boiler."

We would say that the cases are exceptionally rare where the fires require to be drawn from low water. If the water has only fallen below the lower gauge cock, and that gauge cock is from 3″ to 5″ above the crown sheet, and the probability is that the water may be raised soon, the furnace door should be opened and the fire covered with fresh coal; but if there is likely to be a long delay, the fire should be covered with ashes or dirt, thus stopping all additional heat.

If the water is very low and the boiler has become overheated, it would be very unwise to attempt to draw the fire, as in the act of drawing the fire the heat is increased, besides it is attended with great risk to the fireman. We claim when a boiler is short of water, that nothing should be done except to stop the production of all heat.

The engine should be allowed to run, and no changes made until the pressure in the boiler has fallen and the shell of the boiler cooled—in a measure.

It would be the height of folly for a person to "turn on the feed," as the association recommends, for many a poor fellow who has turned the feed on a hot boiler has been blown to parts unknown. The safety valves should not be tampered with, for when raised the water will also rise with the steam, and, coming in contact with the hot plates will often generate a sudden and increasing pressure, which has too often resulted in a disastrous explosion. When such instructions are followed it is a wise course to "warn passers by front of the boiler," and we would prefer to be as far away as possible.

Our advice is always after smothering the fire to allow the pressure to fall and the boiler to cool sufficiently to obviate all danger before attempting to meddle with it. Thus the danger will be very greatly reduced.

Questions and Answers.

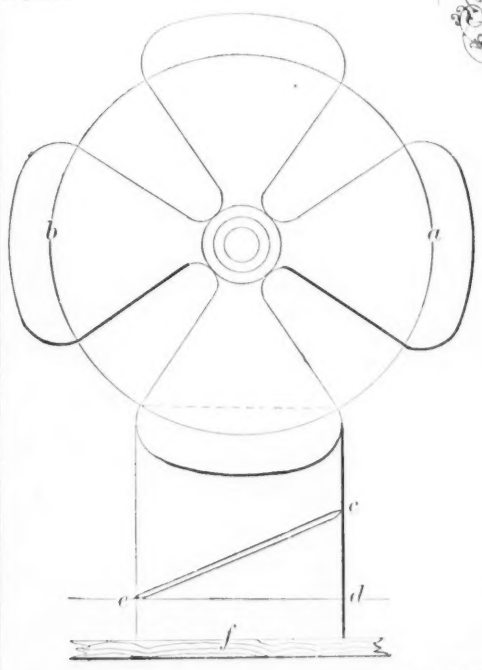
Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) J T. Connersville, Ind., writes: We had a boiler set in February last and we do not understand its actions, neither does our engineer. It is an 18 ft. by 42″ flue and supplies a 12″×20″ engine. The supply pipe is 2½″ and when the saw strikes the log the back end of the boiler quivers. In fact the whole boiler trembles, moving up and down at every revolution of the engine. It seems as if the boiler would shake itself out of place. The back stand under the boiler is 4 ft. from the end and is built up solid. Please state the cause, and if the quivering will injure the boiler. *A.*—Your description of the boiler and engine in question is entirely insufficient to enable us to form any definite ideas as to the cause of the trouble. It would be necessary for you to send us a rough sketch showing the boiler and setting, also a full description of plant. Under the circumstances we would suggest that you consult a good practical engineer as we believe your trouble is in the boiler setting, the foundation being imperfect, or improperly laid.

(2) T. M. Welland, Ontario, writes: I have a steam yacht 26 ft. long and 6 ft. beam, draught 42″ aft and 2 ft. forward. The boiler is 4 ft. long 3 ft. diameter, having 27 return tubes 1½ in. diameter; furnace is 20″×27″. The engine is 4″×6″ and runs 130 revolutions per minute. Boiler pressure is 90 lbs, screw wheel is 30″ diameter, having three blades; speed is 6 miles per hour. I used to have a wheel 24″ diameter which made as good time, but the engine ran about 250 revolutions per minute. I objected to putting in the 30″ wheel without raising the stern pipe, and consequently an offset was made in the keel or shoe. The wheel is between 2 and 3 inches below the bottom of the boat. The shaft is about 7 ft. from engine to extreme end and has a dip aft of 3″ in 4 feet. I wish to know the best and cheapest way to get a speed of 8 or 9 miles an hour. My idea is to raise the stern pipe to give a dip of about 2″ aft and put a 5″×6″ or 6″×6″ cylinder on frame in place of the present one, even if I work with lower pressure of steam. I intend running the boat here on a trip of 8 miles and return. It just takes one hour and twenty minutes to do it without stopping. The canal authorities will not allow us to run any faster, but as we have to stop at different places, thereby delaying the boat (for she cannot recover one minute), I want the extra wheel to make up for lost time.

A.—You do not give the pitch of your wheel but we should judge from your description that you have entirely too much. Your boat is too wide for the length to attain a fast speed, and it will be a very difficult matter to make over eight miles per hour. Raising the stern pipe will not help you out of your difficulty, neither will changing your cylinder. The best way to remedy the difficulty is to make the pitch of your wheel about 42″ and run it 200 revolutions. The offset in the shoe should not be square but well tapered, so as to make the lines easy. 2—If I cut the boat in two and add to her length would it do any good? *A.*—No. 3—Please tell me the simplest and best way to get the lead and pitch of screw wheels?

A.—To ascertain the pitch of a screw wheel place it upon the floor, as shown in the engraving, with the straight face of the blades up. Strike a circle upon the floor the diameter of which is equal to *ab*, or will pass through the widest part of the blade. Measure the distance from the floor *f*, to *e*, also from the floor to *c*, and from the distance *cf* subtract the distance *ef*, the difference will be equal to *cd*. Now as the distance *ed* is to the whole circle *ab*, so is the distance *cd* to the whole pitch, or *ed* : *ab* :: *cd* : pitch required.



(3) D. A. R., Ansonia, Conn., writes: I claim, that with an absolutely perfect engine and condenser, 1st. That the gauge shows not *pounds* but inches of mercury. 2nd. The most perfect vacuum is but 30 inches. 3rd. That a vacuum of 30 inches is equal to only 14.97 effectual pounds of steam. A friend says that a certain condenser gets 39 pounds vacuum; I say not. Which is right? *A.*—Your claim, in reference to the first question, is correct; a pressure of one pound upon a square inch will support a column of mercury, at a temperature of 60°, 2.0376 inches in height; hence it will raise a mercurial siphon gauge one-half of this, or 1.0188 inches. A column of mercury, one inch in height, will counterbalance a pressure of .490774 pounds upon a square inch. Your claim, in relation to the second question, is also correct. In relation to the third question, we would say, that it requires a steam pressure of 14.7 lbs. to support a column of mercury 30″ high. Rule to compute the pressure of steam, when the height of the column of mercury is known: Divide the height of the column of mercury in inches by 2.0376, and the quotient will give the pressure per square inch in pounds. Your friend should inform himself in regard to the nature and uses of a vacuum, as he is evidently at fault.

Business Specials.

40 cts. a line for each insertion under this head.

Lathes, Planers, Shapers, Drills, Bolt and Gear Cutters, Milling Machines. Special Machinery. E. Gould & Eberhardt, Newark, N. J.

W. D. Skidmore. Machinery designed and executed and superintended if desired. Patent Office drawings. Hours 9 to 6. No. 733 Broadway, N. Y.

Engines, Hoisting and Pumping Machinery for Mines. The Band Friction Hoist, which is the safest, simplest, strongest and best in the market. Also, Friction Clutches. Address, Webster Camp & Lane Machine Co., Akron, O.

American Watch Tool Co., Waltham, Mass., Whitcomb Watch Makers' Lathes, and Watch Machinery.

Dixon's Traction Belt Grease. Dixon's Founders' Perfect Wash. Dixon's Plumbago Foundry Facing. Dixon's Graphite Machine Grease. Dixon's Everlasting Graphite Axle Grease Dixon's Dry American Graphite Perfect Lubricator. Send for explanatory circular to Dixon Crucible Co., Jersey City, N. J.

Drop Hammmers. Stiles & Parker Press Co., Middletown, Conn.

Wilkinson & Crowell, 1201 Beach St., Philadelphia, make an Improved Metallic Piston Rod Packing, which is entirely automatic and of great durability. Works well at high or low pressure, and can be used in common stuffing box, or without any stuffing box at all.

See Standard Turbine advertisement in last issue.

Norris & Rutter, Mechanical Draughtsmen and Patent Solicitors, 424 Walnut Street, Philadelphia.

W. Barnet Le Van, Mechanical and Consulting Engineer, 3607 Baring Street, Philadelphia, Pa.

John Douglass, common and fine patterns made to order, also car wheels, working models, and experimental machinery. Shop at Washburn, Hunts and Co. Wheel Foundry, cor. Warren and Bay Sts., Jersey City, N. J.

Engines Indicated—Power Measured. W. H. Odell, Box 274, Yonkers, N. Y.

Second-hand 80 H. P. Tubular Boiler for sale cheap; also one large Blower. David W. Pond, Worcester, Mass.

Sheet Metal Presses. Ferracute Co., Bridgeton, N.J.

Manual of Power for Machines, Shafts, and Belts, with the History of Cotton Manufacture in the United States, by Samuel Webber, C. E., copyrighted 1879. Only work of the kind extant; 240 pages. Price $3. Address, D. Appleton & Co, New York, or the author, Manchester, N. H.

MANUFACTURES.

The Ashcroft Mfg. Co., Boston, have just received an order for two Tabor Indicators, from Pimlico, England (near London.) This indicator was first illustrated and fully described in our issue of May 8.

The Consolidated Safety Valve Co., Boston, have just received a large order for two 2in. "Pop" safety valves, from Chicago, also another for three inch nickel seated "Pop" valves, from one of the largest manufacturers in New England. They are adding new tools and machinery to their shops.

Frick & Co., of Waynesborough, Pa., have shipped, in three large boxes, an eight-horse Eclipse Farm Engine to the Melbourne Exhibition, opening October 1st, at Melbourne, Australia. It is to be used to "transmit power to the various mowers, reapers and binders."

The Hopkins Manufacturing Company, recently organized under an Illinois State charter with a capital of $200,000, as soon as its buildings are ready for occupancy will begin the manufacture of the Hopkins mower and a general line of agricultural implements. A suitable and satisfactory location has been secured at South Lawn, a suburb about two miles south of Riverdale. The company have begun the construction of two large buildings, each 100 feet long by 60 in width, and three stories in height.

The Crane Bros. Manufacturing Company, Chicago, Ill, are employing 500 men on hand-power, steam and hydraulic hoisting machinery.

A Norwich, Conn, manufacturer is filling an order from Australia for cast iron axes, which will be traded with the natives in the northern part of the island for ivory. The axes will last, it is calculated by the Norwich Bulletin, about two hours in chopping ordinary wood.

Mr. Sutton, who proposes to erect a cotton mill at London, Ont., and organize a stock company with a capital of $300,000 to run it, asks the finance committee of the City Council for a bonus of $50,000.

The knife factory at Boonton, N. J., will be enlarged so as to employ forty more hands.

The F. C. Wells Engine Works have recently placed in the North Chicago Rolling Mills, six large pumps with 20-inch steam cylinder, the capacity of each pump being 1,500,000 gallons per day.

Clarke, Reeves & Co., bridge builders, of Phœnixville, Pa., are very busy getting out the drawings and preliminary work for a draw span of 300 feet across the Harlem River, New York. The draftsmen are obliged to work at night to place the order in the shops at the earliest possible date. The bridge is to carry the extension of the Metropolitan Elevated Railroad of New York city across the Harlem River.

The Farmer & Gardner Sewing Machine Company of Springfield, Mass., have begun to put their second 1,000 machines on the market. They are now employing 57 men at the Taylor street factory, and the prospect is that this force will shortly be increased.

The Stockwell Screw and Machine Company, of Cleveland, O., have been compelled to increase the number of their hands. They have put in about $3,000 worth of new machinery and improvements, and intend to still further increase their capacity. They have more orders than they can fill in a month or six weeks.

The machine shops at Ingersoll, Canada, are running twelve hours a day, to meet a very active demand for farmers' implements.

Kreimer & Bro., Cincinnati, have just erected a new furniture factory of 50x112 feet area, and six stories high, into which they are putting the latest and most improved machinery. When in full running operation, the factory will require about two hundred men.

Five years ago the rubber combination entered into a compact with Ackerman of New York, the proprietor of the Star Rubber Works at Naugatuck, Conn., to pay him $5,000 yearly, for five years, to refrain from operating the works. This limit is now nearly reached, and it is currently reported that the shops will be started soon. The machinery in the shops is for rubber manufacture, but in view of the existing heavy rubber interest in the place, it is thought that some other branch of business will be established.

The Amoskeag Corporation of Manchester, N. H., are putting in the foundation for a new mill, which will be 400 feet long—its site is partly upon the new land made by straightening the Merrimack River and the lower machine shop—which will be taken down to make room for the mill.

The Putnam Machine Company, Fitchburg, Mass., have just furnished quite an order of their machine tools to the Consolidated Safety Valve Company, 53 Sudbury street, Boston, in order to enable them to turn out more of their work and keep up with their orders.

Lowe & Watson, boiler makers, Bridgeport, Conn., are so pressed with orders that they lately made application to another well-known concern for help in men and tools. Since the middle of May they have received orders for seventeen boilers, most of them of large size.

The Brown & Sharpe Manuf'g Co., Providence, R. I., will finish their new foundry in September. It will give employment to fifty additional hands.

The South Boston Iron Company employ 300 men, and will shortly add 50 more to the working force. Among the new machines to be set going are the large 10 foot planer purchased several years ago of the navy department; a 38 foot lathe and an immense gear cutter. These machines are required on portions of the new pumping engines being manufactured for the great sewer. They are to be used also for some heavy work for the Calumet & Hecla Mining Company. In addition to this work the company has orders for four rifle guns, to cost $175,000. They will be breech loaders, and severally of 12-inch bore, 26 feet length and 53 tons weight.

The Gautier Steel Works, at Johnstown, Pa., have advanced wages.

The silk mill recently started in Boonton, N. J., by Pegram & Mayer, will soon be enlarged so as to employ 400 hands.

The old New Glasgow (N.S.) foundry, closed for two years past, on account of the depression, was sold last week to Messrs. Caffey, of Truro, and Wilkes, of Westville. The new proprietors intend starting a foundry and machine shop at an early day.

Russell & Co., Massilon, O., manufacturers of agricultural machinery, recently sustained a loss of $25,000 by a fire in their works. They have issued a circular informing their customers that it will cause but little if any delay in filling orders.

A gang of men engaged laying the iron track of the Illinois Central road, in Iowa, with steel rails pulled up one thousand feet of the old track, and then struck for higher wages. They had the company foul, and their demands were conceded.

NITRO-GLYCERINE was discovered in 1847 by an Italian named Soborro. It is made as follows: If a quantity of nitric acid be added to twice its weight of sulphuric acid, and glycerine be poured into this, and stirred carefully, the whole being surrounded by a freezing mixture, we obtain that wonderful substance known as nitro glycerine, which has more than ten times the explosive force of gunpowder. It forms on the surface as an oil of a pale yellow color, is perfectly inodorous, and has a sweet aromatic taste. It is poisonous whether taken internally or absorbed through the skin, and small doses of it produce distressing headaches. It does not explode when brought into contact with fire, and remains unchanged even when raised to a temperature of boiling water; but at forty degrees Fahrenheit it becomes converted into an icy mass, which merely requires friction to develop its explosive qualities.

Machinists' and Engineers' Supplies.

NEW YORK, July 8, 1880.

There is little to report in relation to supplies, as every one who can afford it, and some who can not, have gone a-fishing, and the probability is that we may look for very little change in prices until the latter part of this month, when preparations will begin for the fall trade. Already there are many inquiries in relation to placing contracts.

The Girard Wrench Mfg. Co., Limited, Girard, Pa., have reduced the price of "Girard Standard" Wrenches to discount 50 per cent., and "Girard Agricultural" Wrenches to discount 60 per cent.

The Betts Machine Co., Wilmington, Del., have issued a new price list of their adjustable reamers which they will mail to any one upon application.

A circular has been issued inviting dealers in railway supplies to form an association for mutual benefit.

The following circular explains itself.

Cleveland, O., June 23d, 1880.

Having purchased the interest of C. C. Newton, in the firm of Newton & Cox, I take this opportunity of announcing to you that the business will be continued in my name at the same place as heretofore. I have retained the services of the most skillful and experienced workmen, and am prepared to fill all orders promptly, guaranteeing satisfaction, both as to price and quality.

Soliciting a continuance of your patronage, with the assurance that all orders shall receive personal and prompt attention, I am

Yours very respectfully,
J. D. COX, Jr.

Manufacturer of Twist Drills & Machinists' tools.

The Morse Twist Drill & Machine Co., New Bedford, Mass., have issued a new illustrated price list under date of July 1, 1880. It is fuller than any previous list.

Iron Review.

NEW YORK, July 8, 1880.

The iron market though not active is stronger since our last report, and dealers holding a heavy stock seem to be less anxious to sell. In fact they are unwilling to take orders for delivery beyond the present month. Confidence seems to be strengthened that prices are as low as they will be and full quoted prices are required on sales made. We quote No. 1, $23; No. 2, $22, and grey forge, $21.

Manufactured iron remains the same as last reported.

Pierson & Co., 24 Broadway, N. Y., under date of July 8, 1880, quote prices out of store as follows:

Iron Rails, $50 to $57, according to weight; Fish Plates, 2¾c. per lb.; Railway Spikes, 3c.; Bolts and Nuts, 3½c.; Common Bar Iron, 2.4c., basis from store; Refined do. 2.6c., basis; Ulster, 3.6-10c. basis; Machinery Steel, 6½c.; Best Tool Steel, 13½c.; Norway Bar Iron, 6¼c.; Norway Shapes, 6¾c; Nail Rods, 6¾c.; Sheet Iron, 3½c., basis; Angle Iron, 3¼c.; Tee Iron, 3¾c.; Band Iron, 3.4c.; Hoop Iron, 3.6c., and up according to size; Horse Shoe Iron, 3.3c.; Hot Polished Shafting in lengths, 2 ft. and longer, 9 to 10½c., according to size; Small Black Rivets, 30% off in papers; 10% off in bulk.

Carmichael & Emmens, 130 Cedar St., New York, quote prices of Boiler Makers' Supplies as follows:

Flange, 5c.; C. H. No. 1 Shell, 4c.; Tank, 3c.; C. No. 1, 3½c.; Sheet, 3½c; Angles, 3¼c. Boiler Tubes 50% discount from list.

Metal Review.

LUCIUS HART & CO., 8 & 10 Burling Slip, New York, furnish us the following, under date of July 7th, 1880:

The metal market is strong, although somewhat dull on account of the recent holidays. Pig Tin in London, to-day £84. 10s; Singapore, $26. Would quote this market nominally. Banca Tin 22c.; Malacca and Straits, 19c.; Australian, Billiton and English Refined, 18¾c.; Lamb and Flag 19¼c.; Pig Lead 5¼c. to 5¼c.; Antimony, Cookson, 19c.; Hallett, 17c.; Domestic Spelter, 5¼c.; Silesian, 6c.; Ingot Copper 19¼c. to 19⅝c.; Nickel, $1.25; Solder No. 1, 10½c.; "half-and-half" 12½c.

WANTED.

Wanted.—A situation as Supt. or Foreman of a foundry or machine shop by a man of experience; a draughtsman and a thorough mechanic. No objection to south or west. Address Mechanic, box 1338, Boston P. O., Mass.

Wanted—Experienced and competent foreman to take charge of about fifty men, engaged mostly on mill machinery work. Address, with references, John T. Noye & Sons, Buffalo, N. Y.

Wanted—By an experienced man, situation as Superintendent or Manager of a General Jobbing Foundry and Machine Works. The West preferred. Address Box 86, Toledo, O.

An experienced machinery iron works Superintendent wishes to engage with reliable parties. Address, P. H. L. care AMERICAN MACHINIST office.

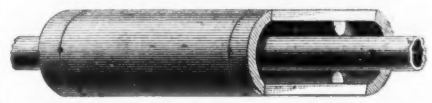
Mechanical Books.

Send 10 cents for 96 page Catalogue of Books for Machinists and Engineers.

D. VAN NOSTRAND,
23 Murray & 27 Warren Sts., New York.

The Raymond Mfg. Co.'s
PATENT
Non-Conductor Coverings for
STEAM PIPES AND BOILERS.

Sectional Air-Space Covering.



Patented Jan. and April, 1870, and Sept., 1877.

American Ash Felting.
Patented March 24, 1874, and July 26, 1875.
Awarded Medal and Diploma at Centennial Exposition.

CEMENT FELTING AND RUSSIA HAIR FELT

FACTORY: 642 W. 52d Street, | OFFICE: 108 Liberty Street,
Send for Circulars. | NEW YORK.

FOR SALE.

A Works completely equipped for the manufacturing of carriage axles; is well located in relation to Coal and Iron, also very accessible to market. Address

E. P. BULLARD,
14 Dey Street, New York.

Drawing Instruments
AND MATERIAL, PAPER, &C.
G. S. WOOLMAN,
116 Fulton Street, New York.
Fully priced and illustrated Catalogues.

KEARNEY & FOOT

Office, No. 78 Chambers Street, N. Y. | **Full Weight Hand-Cut Files.** | Manufactory, PATERSON, N. J.

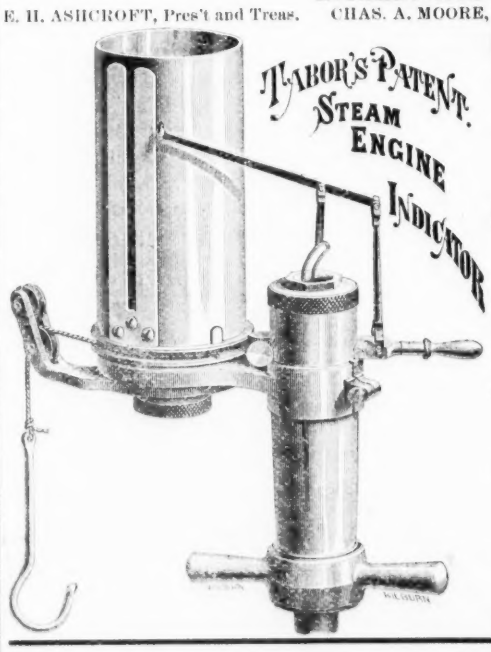
The best and cheapest in the end. Send for quotations. The files speak for themselves in the following testimonials. Read them.

WINCHESTER REPEATING ARMS CO.
MESSRS. KEARNEY & FOOT, New York, New Haven, Conn., Nov. 1st, 1878.
Dear Sirs:—The Files you have been furnishing this Company have proved equal to, if not superior, to any heretofore used. Yours truly, V. A. KING, Sup't.

NORTH RIVER IRON WORKS.
TO WHOM IT MAY CONCERN: New York, May 1st, 1877.
We have used the Files made and re-cut by Messrs. KEARNEY & FOOT for the past three years, and we know of no better recommendation than the fact that we are still using them.
FLETCHER, HARRISON & CO.

We print instructions on the use of Files, and also give the diameters of round and square Files from 3 to 16 inches. They are on card board, 10x12 in., and are intended to be put up in the shop for the men to read. We are pleased to mail them to any manufacturer on receipt of the necessary 6 cents postage.
Respectfully, KEARNEY & FOOT.

ESTABLISHED 1851.
E. H. ASHCROFT, Pres't and Treas. CHAS. A. MOORE, Gen. Manager. MARTIN LUSCOMB, Clerk



The Ashcroft Manufacturing Co.
Successors to E. H. ASHCROFT,
"Original Steam Gauge Works."
THE E. H. ASHCROFT
Improved "Bourdon" Steam Gauges,
Sole Owners and Manufacturers of
TABOR'S PATENT
STEAM ENGINE INDICATORS,
Specially adapted to
Indicating High Speed Engines & Locomotives
STEAM AND WATER GAUGES,
Railway, Steamship & Machinery Supplies
WAREROOMS:
Nos. 51 & 53 Sudbury St., and
8, 10, 11, 12 & 14 Bowker Street,
BOSTON, MASS.
Factories, BOSTON and LYNN.

THE BEST IN THE WORLD.

HALL'S PATENT
Compound Lever Cutting Nippers.

Every pair Warranted to Cut Steel Wire.
Worn or Damaged Parts can be replaced at a trifling cost.
Manufactured ENTIRELY OF STEEL by
THE INTERCHANGEABLE TOOL COMPANY,
A. GUSTAM, General Agent, 32 Howard St., N. Y.
For sale by all dealers in Machinists' Tools and Hardware. Send for Price List.

NICHOLSON FILE CO.

SOLE MANUFACTURERS OF

FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS and SPECIALTIES.

"Nicholson File Co's" Files and Rasps.
"Double Ender" Saw Files.
"Slim" Saw Files.
"Racer" Horse Rasps.
Handled Rifflers.
Machinists' Scrapers.
File Brushes, File Cards.
Surface File Holders.
Vice File Holders.
Stub Files and Holders.
Improved Butchers' Steels.

Manufactory and Offices at PROVIDENCE, R. I., U. S. A.

NEWARK STEEL WORKS.

BENJAMIN ATHA & CO.

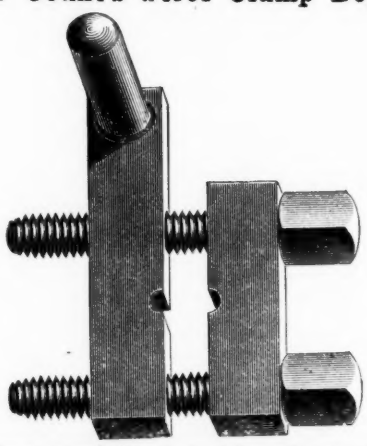
MANUFACTURERS OF

CAST STEEL

WE MAKE GRADES OF STEEL SPECIALLY ADAPTED TO THE MANUFACTURE OF LATHE TOOLS, CHISELS, TAPS & DIES

BENJ. ATHA. NEWARK, NEW JERSEY. J. ILLINGWORTH.

Le Count's Steel Clamp Dog.



These are made from the Steel Bar and hardened all over, as well as the Screws. They will carry all that can be put on them. The tail is Steel, turned and driven into a taper hole. The Screw Head is a ball, and will accommodate itself to a straight or taper piece.

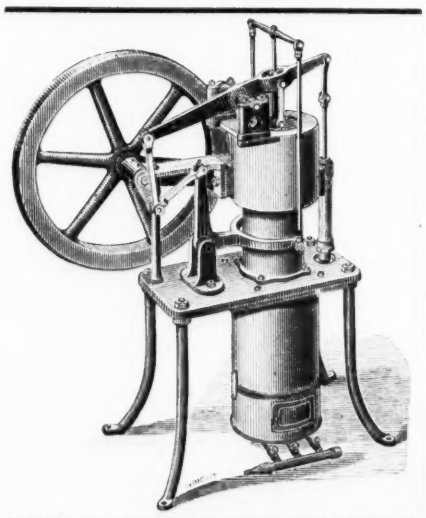
PRICES.

No. 1 opens 1	inch,	- - -	$1.25
" 2 " 1½	"	- - -	1.50
" 3 " 2	"	- - -	1.75
" 4 " 3	"	- - -	2.00

MANUFACTURED BY

C. W. Le COUNT,

SOUTH NORWALK, CONN.



ERICSSON'S NEW PATENT CALORIC PUMPING ENGINE is specially intended for domestic use in lifting and forcing water from wells and cisterns, or from Croton pipes, to tanks on upper floors of buildings in city or country.

All kinds of fuel will answer for this engine, but coal-gas is preferable, the consumption being only 15 cubic feet per hour. Besides gas is handier and cleaner than coal or other combustibles. Servant girl can operate it!

Price for 8-inch cylinder, pumping 350 gallons per hour 50 feet: With gas furnace, - $260 00
With coal furnace, - 275 00
Price for 6-inch cylinder, pumping 200 gallons per hour 50 feet: With gas furnace, - $210 00
With coal furnace, - 220 00

Manufactured by the Delamater Iron Works.
C. H. DELAMATER & CO., Proprietors,
No. 10 CORTLANDT ST., N. Y. CITY.

W. BARNET LeVAN,

Mechanical & Consulting Engineer,
3607 Baring St., Philadelphia, Pa.

S. C. FORSAITH & CO.,

MANCHESTER, N. H.

AND

213 CENTRE STREET, N. Y.

SPECIALTIES:

Abbe Bolt Machines,

POWER HAMMERS,

Combined Hand Fire Engine and Hose Carriage.

NEW AND SECOND-HAND MACHINERY.

Send stamp for Illustrated Catalogue, stating fully just what you want. Over 2,000 machines, new and second-hand; fully described, with prices annexed, in our List No. 20.

CHAS. G. LUNDELL,

No. 7 Exchange Place,

BOSTON, MASS.

SWEDISH IRON

REPRESENTING

EKMAN & CO.

GOTHENBURG, SWEDEN.

POOLE & HUNT, BALTIMORE.

MANUFACTURERS OF

THE POOLE & HUNT LEFFEL TURBINE

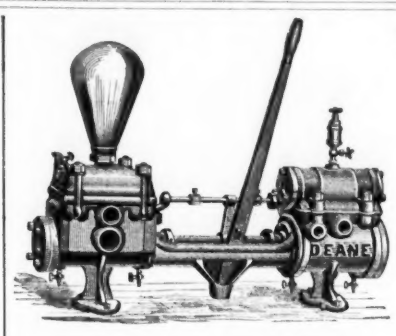
WATER WHEELS,

MACHINE MOULDED MILL GEARING,

SHAFTING, PULLEYS AND HANGERS,

STEAM ENGINES AND BOILERS,

MIXERS FOR FERTILIZERS AND CHEMICALS.



SIMPLE! POSITIVE! DURABLE!

For Every Possible Duty.

The Best STEAM PUMP in America.

"The Deane."

SEND FOR ILLUSTRATED CATALOGUE AND PRICE LIST.

DEANE STEAM PUMP CO.

OFFICE AND WORKS:

HOLYOKE, MASS.

WAREROOMS:

92 and 94 LIBERTY ST.,

NEW YORK CITY.

7 OLIVER STREET, BOSTON.

BRADLEY'S CUSHIONED HELVE HAMMER.

Awarded first premium, Silver Medal at American Institute Fair, 1873, Cincinnati Industrial Exposition, 1874, and the Diploma of Honor and Grand Medal of Merit at the Centennial Exhibition, in 1876,

Being the highest award given any goods of their class in America or Europe.

IT HAS MORE GOOD POINTS, LESS COMPLICATION,
MORE ADAPTABILITY, LARGER CAPACITY,
DOES MORE AND BETTER WORK, TAKES LESS POWER,
COSTS LESS FOR REPAIRS
THAN ANY HAMMER IN THE WORLD.

Guaranteed as represented. (Established 1832.)

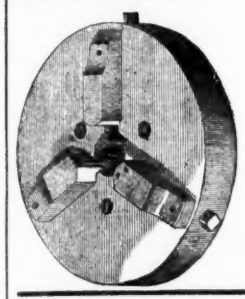
Branch Office, 46 & 48 WEST LAKE STREET, CHICAGO, ILL.

BRADLEY & COMPANY, Syracuse, N. Y.

The E. HORTON & SON CO.

Windsor Locks, Conn.

Prices Reduced.



MANUFACTURERS OF

THE HORTON LATHE CHUCK,

BOTH

INDEPENDENT AND UNIVERSAL,

ALSO THE

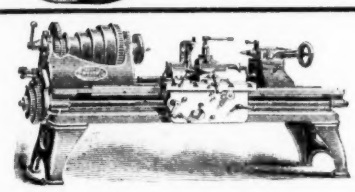
Horton Car Wheel Chuck.

FEBRUARY 1st, 1880.

From this date a discount of 25 per cent. will be made from the list price of The Horton Lathe Chuck,

Soliciting your orders, we are, respectfully yours,

Send for Price List. THE E. HORTON & SON CO.



New Haven Manf'g Co.

NEW HAVEN, CONN.

Iron-Working Machinery,

PLANERS, SHAPERS, DRILLS

The Workshop Companion.

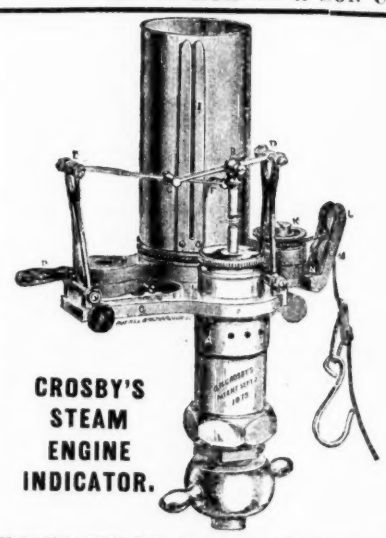
A handy and useful book of practical information for **Engineers, Machinists, Draughtsmen and Mechanics,** containing useful and reliable recipes, rules, processes, methods, practical hints, &c. **NO** medical or cookery recipes. 164 pages. This book will be sent, post-paid, on receipt of Twelve 3-cent postage stamps.

T. P. PEMBERTON,
5 Dey Street, Room 13, New York.

Send for Circular containing list of

Practical Articles

Contributed to the AMERICAN MACHINIST by 40 of the best writers.



CROSBY'S STEAM ENGINE INDICATOR.

CROSBY STEAM GAGE & VALVE CO.

J. H. MILLETT, Pres't.
GEO. H. CROSBY, Sup't. GEO. H. EAGER, Treas.

Sole Proprietors and Manufacturers of

CROSBY'S

Adjustable "Pop" Safety Valve.
Self-Regulating Reducing Valve.
Improved Steam Pressure Gage.
Self-Closing Water Gage.
Improved Steam Engine Indicator.

Sole Manufacturers and General Agents for

The "VICTORY" Steam Cylinder Lubricator.

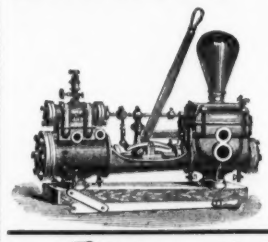
And all instruments of this class. Send for Illustrated Catalogue.

Cor. Milk & Batterymarch Sts., Boston.

FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS,

JAS. HUNTER & SON, North Adams, Mass.

KNOWLES' IMPROVED STEAM PUMPS,



THE STANDARD!

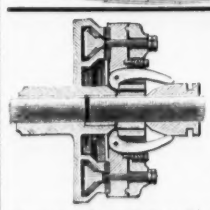
Steam Pumps for Every Possible Service.

SEND FOR ILLUSTRATED CATALOGUE.

KNOWLES STEAM PUMP WORKS,

86 Liberty Street, NEW YORK.

44 Washington Street, BOSTON.



Hoisting Engines & Elevators

Safe, Durable and Reasonable in Price.

Friction Clutch Pulleys and Cut-off Couplings.

We manufacture the "Giant Friction Clutch Pulley," known as the "Captain." Is the **Best in the World** for connecting the gearing of callender rolls, hoisting coal, logs or freight. Our Clutch can connect any amount of power, at any speed, without slacking the motive power in the least, and gives no shock, is easy to ship and unship, in *fact*, this is the only Clutch that can do heavy work satisfactorily. **D. FRISBIE & CO., New Haven, Conn.**

Largest Establishment of the Kind in the World.

MOSS ENGRAVING CO.

J. C. MOSS, Pres't and Sup't. *Incorporated April 2, 1880.* J. E. RAMSEY, Secretary.
R. B. MOSS, Ass't Sup't.
M. A. MOSS, Treasurer. **MOSS' NEW PROCESS.** H. A. JACKSON, Ass't Sec'y.

535 PEARL STREET, COR. ELM, NEW YORK.

IMPORTANT TO MACHINERY MANUFACTURERS AND DEALERS.

Engraved Plates for Newspaper, Book and Catalogue Illustrations, &c., executed in Type Metal in a superior manner by a new and improved photo-chemical method, from all kinds of Prints, Pen Drawings, Photographs, Tin Types, Original Designs, Pencil Sketches, and, when available, from the object itself. *Much Cheaper than Woodcuts.* These plates are mounted type high, ready for use on any ordinary press, and are guaranteed to be fully equal to the best woodcuts. Electrotypes can be made from them in the usual manner. We also have a fully equipped steam electrotyping department. Engravings of **MACHINERY** of all kinds executed in the highest style of the art at reasonable prices. **Mr. Moss, in withdrawing from the Photo-Engraving Co., 67 Park Place, has retained for himself all improvements made and used by him in Photo-Engraving since May, 1872.** Our motto is, "The Best Work at Low Prices. Always on Time." Send stamp for illustrated circular. Send copy for estimate. Please mention this paper.

UNITED STATES METALLIC PACKING CO.

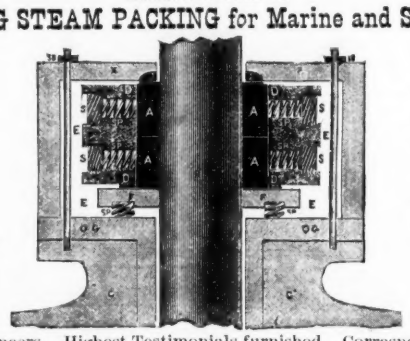
MANUFACTURERS OF

SELF-ADJUSTING STEAM PACKING for Marine and Stationary Engines.

PATENTED.

February 10th, 1863.
March 7th, 1871.
October 8th, 1872.
April 21st, 1874.

Other Patents Pending.



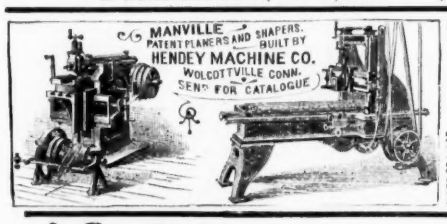
SECTIONAL VIEW.

A A—Packing Blocks.
C C—Ring enclosing Blocks
D D—Projections for Springs and Set Screws.
E E—Space for Vibration.
F F—Follower.
G G—Cylinder Head.
S S—Set Screws.
S B—Stud Bolts.
J—Ball Joint.
O G—Gland.
S P—Springs.
X X—Case.
R—Rod.
S—Set Screws.

Endorsed by leading engineers. Highest Testimonials furnished. Correspondence solicited. Makers, Sellers and Users will be held responsible for infringement

EDW. CUNNINGHAM, President.
JOSIAH A. OSGOOD, Superintendent, 85 Devonshire Street, Boston, Mass.

C. H. JACKSON, General Agent, 34 Coal & Iron Exchange, New York.

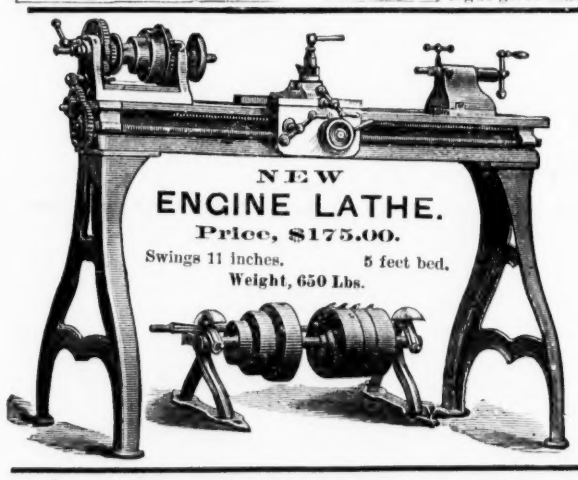


The Hendey Machine Co.

WOLCOTTVILLE, CONN., U. S. A.

Manville Patent Iron Planers and Shapers.

15 in. Shapers, 24 in. Shapers, 3½ ft. x 16 in., 5 ft. x 20 in., 6 ft. x 24 in., 8 ft. x 24 in. Planers, Amateurs' Hand Planers, with chuck and centers, Hollow Steel Spindle Hand Lathes, Brass and Wire Slitters, Spring Chuck, and Common Clock Lathes. Catalogue gives many names of users of our tools.



A. F. Prentice & Co.

Manufacturers of

Light Machinists' Tools.

Improved Upright Drills, with Lever Feed and Wheel Feed with Quick Return Motion.

Hand and Foot Power Lathes.

SLIDE RESTS.

Special Machinery and Machine Jobbing.

FOOT POWER LATHES A SPECIALTY.

54 Hermon Street
WORCESTER, MASS

SAMUEL A. BECKETT, Mechanical Engineer. FREDERICK H. McDOWELL, Engineer of Mines.

Beckett & McDowell,

Formerly with Union Iron Works (PRESCOTT, SCOTT & Co.) of San Francisco, Cal.

MINING AND MECHANICAL ENGINEERS

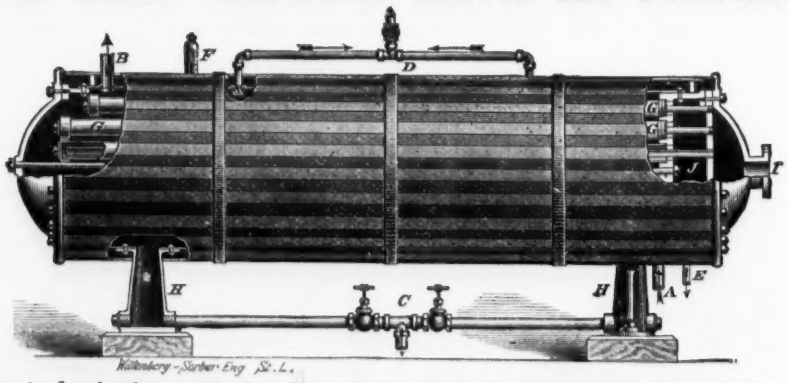
AND MANUFACTURERS OF

Steam Engines and Mining Machinery,

Office, 17 COURTLANDT ST., NEW YORK.

Works at Arlington, N. J.

THE MORSE FEED-WATER HEATER AND PURIFIER.



Guaranteed to be the most perfect device in the market for utilizing the exhaust of steam engines. For further particulars, address

E. L. MORSE, Mechanical Engineer, 313 Olive Street, St. Louis, Mo., or J. F. WANGLER, St. Louis Boiler Works.

Address P. O. Box 2187. **PIERSON & CO.** Office, 24 Broadway, N.Y.

ESTABLISHED 1790.

IMPORTERS AND DEALERS IN

IRON and STEEL of every Description.

Warehouse, 24 & 26 Broadway, and 77 & 79 New Street.

PRICE LISTS FURNISHED ON APPLICATION.

H. PRENTISS AND COMPANY

Manufacturers of PATENT RELIEVED

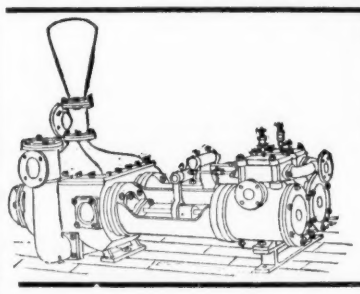
Machinists', Blacksmiths' and Gas Fitters'

Taps; Dies, Reamers and Screw Plates, &c., &c.

DEALERS IN MACHINISTS' SUPPLIES.

No. 14 DEY STREET, - NEW YORK.

Agents for The Billings & Spencer Co., Reynolds & Co.'s Screws, Deverall's Patent Oilers.



Worthington Steam Pumps,

For all purposes and of all Sizes.

PRICES BELOW THOSE OF ANY OTHER STEAM PUMP IN THE MARKET.

WATER METERS. OIL METERS.

THE WORTHINGTON PUMPING ENGINES FOR WATER WORKS.

Used in over 100 Water Works Stations.

HENRY R. WORTHINGTON,

239 Broadway, N. Y. 709 Market street, St. Louis,
83 Water street, Boston.

JAMES W. SEE, Consulting Engineer,

HAMILTON, OHIO.

Betts Machine Co.

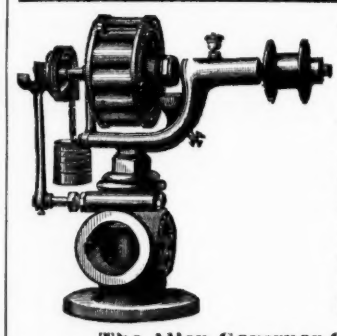
WILMINGTON, DEL.

Makers of

HEAVY MACHINISTS' TOOLS

of the various kinds for working Iron and Steel; Standard Gauges, Measuring Machines, &c., &c.

Send for Circulars and list of tools on hand for immediate delivery.



The only perfect Engine Governor in the World. Especially guaranteed to accurately govern variable cut-off Engines. Send for Circular and REDUCED Price-List.

The Allen Governor Co.

B. W. Spence, Treas. BOSTON, MASS.

Dead Stroke POWER HAMMERS

Are superior to all others for Forging and Die Work. Over 500 now in use.

Manufactured by

PHILIP S. JUSTICE,
14 N. 5th St., Philadelphia, Pa.

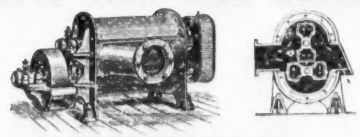
WILLIAM COOKE,

(Successor to COOKE & BEGGS,)

6 Cortlandt St., New York,

SELLING AGENT FOR

ROOTS' NEW IRON BLOWER.



POSITIVE BLAST.

IRON REVOLVERS, PERFECTLY BALANCED

IS SIMPLER, AND HAS

FEWER PARTS THAN ANY OTHER BLOWER.

ROOTS'

Blacksmith's Hand Blowers, Portable Forges, and Tuyeres.

☞ SEND FOR PRICE LIST. ☜

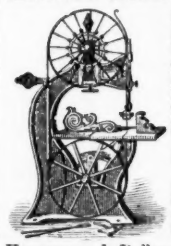
ALTCHISON & DOOLITTLE SOLE MANUFACT'S OF
STEAM FLUE CLEANER
CLEVELAND O
PAT JULY 15 '79
A & B SECTION VIEW
CIRCULARS ON APPLICATION
WOOD & DRAKE 71 RUTGERS ST. N.Y.
ACTS FOR NY & N J

WOOD WORKING MACHINERY.

J. A. FAY & CO.,

BUILDERS OF

IMPROVED MACHINERY FOR WOOD CUTTING.



Numbering some 300 different Machines—Planing and Matching Machines, Surface Planing Machines, Molding and Tenoning Machines, Mortising and Boring Machines, Carving and Dovetailing Machines, Shafting and Friezing Machines, Horizontal and Vertical Boring Machines.

Improved Variety & Universal WOOD WORKERS.

Band, Scroll, Ripping and Cutting-off Saws, Band and Circular Resawing Machines, Spoke and Wheel Machinery, Shafting, Hangers and Pulleys, etc., etc. Original in design, simple in construction, perfect in workmanship, saves labor, economizes lumber, and its productions are of the highest standard of excellence. ***Send for Circulars and Prices.***

J. A. FAY & CO., Cincinnati, Ohio, U.S.A.

Small Tools of all kinds; GEAR WHEELS, parts of MODELS, and materials of all kinds. Catalogue free. GOODNOW & WIGHTMAN, 175 Wash'ton St., Boston, Mass.

E. E. GARVIN & CO.

Manufacturers of

Milling Machines, Drill Presses,

No. 4 Milling Machine.

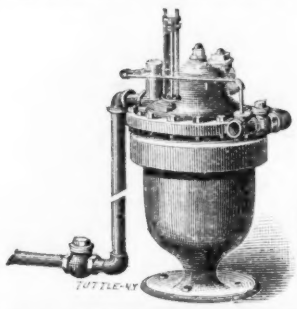
Hand Lathes, Tapping Machines, Cutter Grinders and Wood Planers. Milling Cutters, all shapes and sizes. Gear Cutting and Milling in all its branches.

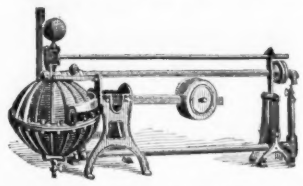
139-143 CENTRE ST.
Cornell's B'ld'g
NEW YORK.

☞ Send for illustrated Catalogue.

TOOLS for Machinists, Carpenters, Amateurs, Jewellers, Model Makers, Blacksmiths, etc. *Send for Catalogue*, and state *what kind* of Tools you require. TALLMAN & McFADDEN, 607 Market St., Philadelphia, Pa.

THE ALBANY STEAM TRAP.



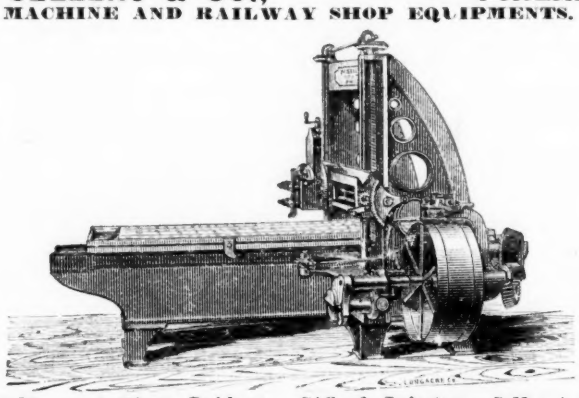


This Trap automatically drains the water of condensation from HEATING COILS, and returns the same to the Boiler, whether the coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes. Address

ALBANY STEAM TRAP CO.,
ALBANY, N. Y.

WILLIAM SELLERS & CO., - - - PHILADELPHIA.
MACHINE AND RAILWAY SHOP EQUIPMENTS.

Shafts, Couplings, Hangers, Pulleys, Mill Gearing, Etc.



Lathes, Planers, Drills, Shapers, Bolt Cutters, Etc.

Railway Turntables and Pivot Bridges. Gifford Injectors, Sellers' Improvements.
NEW PATTERNS. SIMPLE, EFFECTIVE.
NEW YORK OFFICE, 79 LIBERTY STREET.

Steam Pumps,

AIR COMPRESSORS,
Friction Hoisting Engines,
Vacuum Pumps & Condensers,
GENERAL MACHINERY
Steam Engines.

Capacity to bore Cylinders 110 Inches Diameter, and turn Fly Wheels of 24 feet.

THE NORWALK IRON WORKS CO.
South Norwalk, Conn.

Goulds Manufacturing Co.

Manufacturers of all kinds of
Force and Lift PUMPS
For Cisterns, Wells, Railroads, Steamboats, Windmills, etc.
FIRE ENGINES,
Hydraulic Rams,
AMALGAM BELLS
For Churches, Schools, and Plantations.
Corn-Shellers, Sinks, etc.
Pumps and Materials for Driven Wells a specialty.
Satisfaction guaranteed.
Catalogues furnished, upon application.
INQUIRE FOR GOULDS PUMPS
FACTORY, SENECA FALLS, N. Y.
WAREHOUSE, 15 PARK PLACE, NEW YORK CITY.

Monitor Binders FOR THE **American Machinist,**
$1.00 EACH BY MAIL OR EXPRESS.

FRASSE & COMPANY,

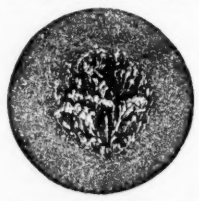
62 Chatham Street New York,
PROPRIETORS OF THE
Briggs, & Leader, Lathes,
SOLE AGENTS FOR
ELTERICH'S TAPS AND DIES,

Comprising the best assortment and largest variety, of threads, from 1-16 to ¼ inch in the United States.
Send for circular.
Importers of STUBS' TOOLS, FILES, and STEEL WIRE, and GROBET FILES.
Agents for the U. S. of Rollason's Patent Steel Music Wire.
No. 0 to No. 32 (Music Wire Gauge) always in Stock.
Sole Agents for Chateau's French Emery Paper.
Fine Tools, Files, Steel Wire,
Silver Solder for Brazing Band Saws,
AND SUPPLIES FOR MACHINISTS A SPECIALTY.

F. W. MOSS,

80 John Street, New York,
(Successor to Joshua Moss and Gamble Bros.,)
Steel and Files,
HAMMERS, ANVILS, VISES AND BLACKSMITHS' TOOLS.
WARRANTED CAST STEEL,
Specially adapted for Dies, Punches, Turning Tools, Drills, &c. Also

IMPROVED MILD-CENTRED CAST STEEL

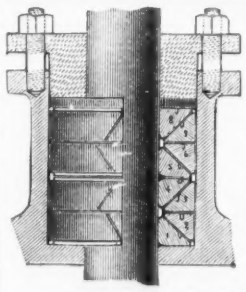


For Taps, Reamers, Milling Tools, &c.

Warranted not to crack in hardening Tools of any Size.

WILEY & RUSSELL MF'G CO.
GREENFIELD, MASS.
Lightning Screw Cutting Machinery and Tools.

SEND FOR ILLUSTRATED PRICE LIST.



KATZENSTEIN'S Self-Acting Metal Packing,
For Piston Rods, Valve Stems, &c. of every description, For Steam Engines, Locomotives, Pumps, &c., &c.
Adopted and in use by the principal Iron Works, Engine Builders and Steamship Companies within the last eight years in this and foreign countries.
For full particulars and references address
L. KATZENSTEIN & CO.,
35 Desbrosses St., New York.

IMPROVED
Anti-Incrustation Liquid,
For the Prevention and Removal of
SCALE IN STEAM BOILERS.
Is purely a liquid, free from sediment, contains no acid, and is absolutely safe and effective.
Prof. H G. Torrey, of the U. S. Assay Office, says: "Downer's Improved Boiler Liquid is free from all injurious substances, and well adapted to accomplish the object sought; know of nothing better and highly recommend it."
Circulars and references on application.
A. H. DOWNER,
PROPRIETOR AND SOLE MANUFACTURER,
17 Peck Slip, - New York.

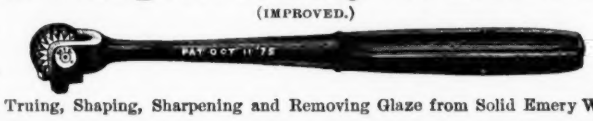
New Mechanical Movement.

Patented March 9th, 1880.
A POSITIVE AND PERFECTLY NOISELESS SUBSTITUTE FOR PAWL AND RATCHET.
Edward Wright & Co.
561 Main Street,
WORCESTER,
MASS.

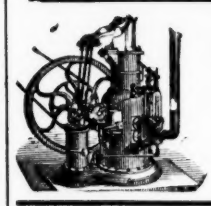
P. BLAISDELL & CO.
MANUFACTURERS OF
Machinists' Tools,
Worcester, MASS.

Machinists' and Foundry **SUPPLIES.**
Twist Drills, TAPS & DIES, Calipers, &c.
Miners' Supplies Of every description.
T. B. BICKERTON & CO.
No. 12 South Fourth St.
PHILADELPHIA, Pa.
Steam Packing. Cotton Waste.
Foundry Facings. BRUSHES.
Gum and Leather **BELTING, HOSE, Etc.**

The Huntington Emery Wheel Dresser.
(IMPROVED.)
Invaluable to Users of Emery Wheels.

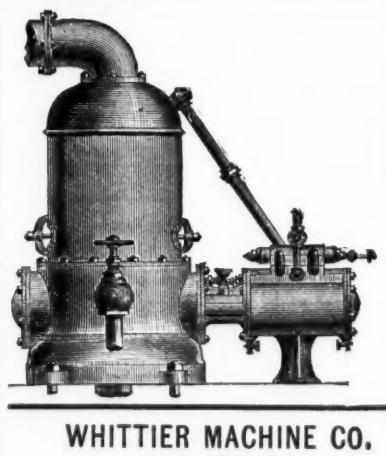


Thousands In Successful Use.
For Truing, Shaping, Sharpening and Removing Glaze from Solid Emery Wheels.
Price $4.00. Send for Circular. **C. E. ROBERTS & CO., CHICAGO, ILL.**



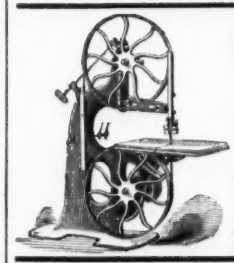
AIR ENGINES.

NO WATER. NO ENGINEER.
No Extra Insurance! Absolutely Safe! Simple! Reliable! Durable!
Most Convenient and Economical Power Known.
SHERRILL ROPER AIR ENGINE CO.
Manufacturers of Air Engines, Elevators and Hoisting Machinery,
91 & 93 Washington St., New York.



20 Per Cent. Saving in Fuel,
25 Per Cent. Increased Power,
BY ATTACHING
HAMILTON'S INDEPENDENT AIR PUMP
AND CONDENSER
TO YOUR ENGINE.
Manufactured only by
SAWTELLE & JUDD,
HARTFORD, CONN.

WHITTIER MACHINE CO.
MANUFACTURERS OF
STEEL BOILERS,
Steam Engines and Elevators,
Boston, Mass.: Works, 1176 Tremont St.
N. Y. Office, 120 Broadway.

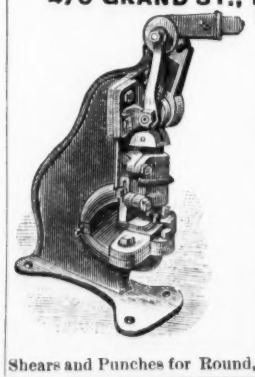


THE
Rollstone Machine Co.
FITCHBURG, MASS.
Rotary and Stationary Bed Planers, Wardwell's Patent Saw Benches,
Waymouth Lathes,
and large number of special machines.
We also carry a large stock of Second-Hand Machinery. Send for Catalogue.

Pattern and Brand Letters.
VANDERBURGH, WELLS & CO.
Printers' and Engravers' Warehouse,
Corner Fulton and Dutch Sts.,
NEW YORK.

Taps & Dies, Morse Twist Drills, Calipers, Dividers, Stubs Tools, Stubs Files, Stubs Steel, Grobet Files, Carvers, Gravers, Chucks, Speed Indicators, Vises, Hammers, Machine, Set & Cap Screws, &c., &c.
THE ONLY Exclusive Tool Store IN PHILADELPHIA.
HEADQUARTERS FOR TOOLS of all DESCRIPTION.
L. B. EATON, TOOL STORE
11 N. 6th St. PHILA.

E. LYON & CO.
470 GRAND ST., NEW YORK.
Sole Manufacturers of



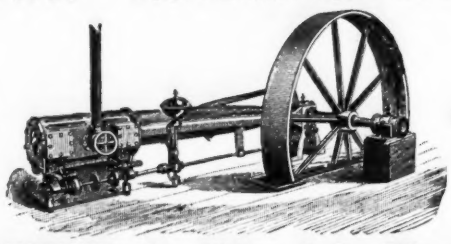
HYDRAULIC JACKS AND PUNCHES,
HYDRAULIC PRESSES,
HYDRAULIC PUMPS,
POLISHING AND BUFFING MACHINERY.
Shears and Punches for Round, Square and Flat Irons.

PRENTISS PATENT VISES,

ADJUSTABLE JAWS,
Stationary and Patent Swivel Bottoms,
Adapted to all kinds of Vise work.
HALL M'F'G CO., 23 DEY ST., NEW YORK.
SEND FOR CIRCULAR.

THE "BROWN" AUTOMATIC CUT-OFF ENGINE.

UNEXCELLED FOR **WORKMANSHIP, ECONOMY** AND **DURABILITY.**



WRITE FOR PRICES AND INFORMATION.

C. H. BROWN & CO., Sole Manufacturers,
FITCHBURG, MASS.

THE
LAWRENCE ENGINE,

A FIRST-CLASS AUTOMATIC CUT-OFF STATIONARY

ENGINE.

Highest Economy. *Best Workmanship at a Moderate Price.*

ARMINGTON & SIMS, - LAWRENCE, Mass.

JARVIS PATENT FURNACE
FOR SETTING STEAM BOILERS.

Economy of Fuel, with increased capacity of Steam Power.
The same principle as the SIEMENS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire.
Will burn all kinds of waste fuel without a blast, including screenings, wet peat, wet hops, sawdust, logwood chips, horse manure, &c.
Send for Circular.

A. F. UPTON, General Agent,
7 Oliver St., (P. O. Box 3401) Boston, Mass.

BARKER & BERTON, New York Agents, 422 East 23d St.

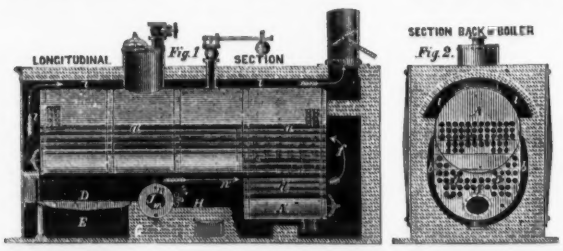
LATHE ATTACHMENTS
FOR MILLING
Plane and Irregular Forms.
Taps and Reamers Fluted and Gears cut without removing from the lathe centers.
See American Machinist, Sept. 13 and 20.
For circular address WM. MAIN,
65 Henry Street, Brooklyn, N. Y.

CHARLES MURRAY.
ENGRAVER ON WOOD.
No. 58 ANN ST.
NEW YORK.

THE NASON MANUFACTURING CO.
DEALERS IN
Plain and Galvanized Wrought Iron Pipe,
AND MANUFACTURERS OF
STEAM AND GAS FITTINGS,
Steam Traps, Patent Vertical Tube Radiators, Steam and Hot Water Boilers, Steam Warming and Ventilating Apparatus, etc.
Nos. 71 Beekman and Fulton Streets, New York.

MONTGOMERY BOILER AND MACHINE WORKS.

WM. T. BATE & SON, East Conshohocken, PENNA.
MANUFACTURERS OF
Bate's Patent Steam Generator.



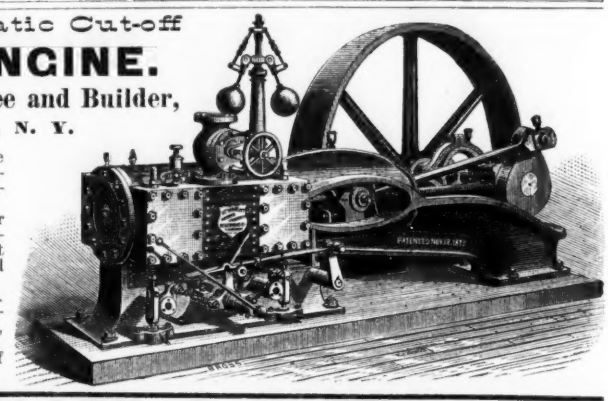
Iron Founders,
Boiler Makers AND
Machinists.

A large number of these boilers in use in the best establishments and institutions, showing **Splendid Results** in the way of economy, efficiency durability and convenience of cleaning. We refer to parties using. Write for particulars.

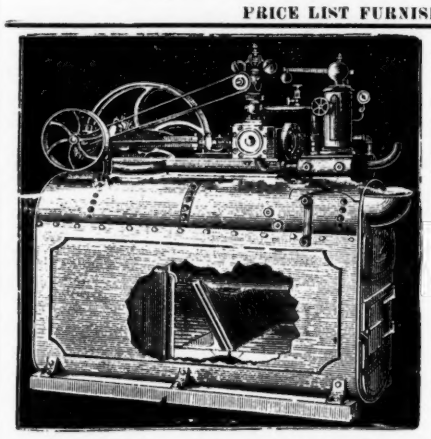
THE
HANCOCK INSPIRATOR CO.
MANUFACTURERS OF
INSPIRATORS, EJECTORS,
—AND—
GENERAL JET APPARATUS,
34 Beach Street, Boston, Mass.
35 Queen Victoria St., London, England.

Patent Automatic Cut-off
STEAM ENGINE.
Wm. Wright, Patentee and Builder,
NEWBURGH, N. Y.

The most economical in the use of fuel, the simplest in construction, and altogether the best cut-off engine in the market.
COMPOUND ENGINES for City Water Works; also for Manufacturing purposes, &c. (Highest duty guaranteed.) Marine and Stationary Engines.
STEAM BOILERS and TANKS. Light and Heavy Forgings, Shafting, Pulleys, Hangers, Mill Work, Iron and Brass Castings, &c.
A large general assortment of Patterns on hand.



SWEETLAND & COMPANY,
No. 126 UNION ST., NEW HAVEN, CONN.
Sole Manufacturers of
THE SWEETLAND CHUCK,
Independent, Universal and Eccentric Combination.
PRICE LIST FURNISHED ON APPLICATION.

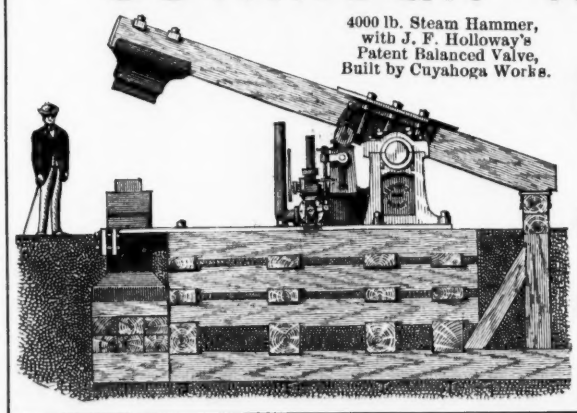


PORTABLE AND STATIONARY
Engines and Boilers,
2½ to 15 H. P. Return Flue Boiler, large Fire Box, no sparks. Do not fail to send for circular to
SKINNER & WOOD, Erie, Pa.

STEPHENS' PATENT PARALLEL VISE, with Swivel, Taper, Pipe and other attachments, is the handiest and most attractive in use, and is adapted to every variety of manufacture from Jewelers' to Locomotive Works. Twelve years constant use, ten hours each day, proves to us that a man cannot wear it out in a lifetime. Its parts are interchangeable. It opens **further,** holds **firmer,** is **heavier** and more **durable** than any other vise. Selected vises sent to any address by Express or C. O. D., with privilege of examining before taking. Write for illustrated circular. **Stephens' Patent Vise Co.,** 41 Dey Street, New York, U. S. A.

CHRISTIANA MACHINE Co's SPECIALTIES.
PORTABLE · BURR · MILLS
MILL & FACTORY GEARING.
CIRCULAR SAW MILLS
with improved Ratchet head blocks
STEAM ENGINES.
SHAFTING PULLEYS AND HANGERS.
TURBINE WATER WHEELS
AND MILLING SUPPLIES.
ADDRESS. CHRISTIANA. LANCASTER Co. Pa.

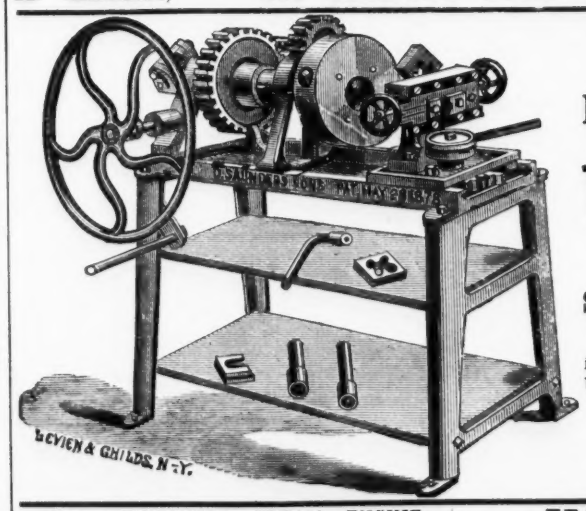
CUYAHOGA WORKS



4000 lb. Steam Hammer, with J. F. Holloway's Patent Balanced Valve, Built by Cuyahoga Works.

Steam Hammers
LAND
AND
MARINE ENGINES
VERTICAL
Blowing Engines
For Blast Furnaces.
Cleveland, Ohio, U. S. A.

KORTING'S
UNIVERSAL INJECTOR,
A COMBINED PUMP AND BOILER FEEDER.
No Adjustment for Variable Steam Pressure. Operated by One Handle. Send for Circular.
A. ALLER, - - 109 LIBERTY STREET, - - NEW YORK.



D. SAUNDERS' SONS
New Pipe-Threading Machine
The I.X.L.
FOR HAND OR POWER.
Manufacturers of
Steam & Gas Fitters' Tools.
Pipe Cutting and Threading Machines for Pipe Mill Use, &c., a Specialty.
YONKERS, N. Y.
SEND FOR CIRCULARS.

THE ECONOMIZER STEAM ENGINE
Has no superiors. Comprises Simplicity, Durability and Economy. Send for catalogues. Also, a large stock of second-hand Steam Engines and Machinery.
S. L. HOLT & CO.
7 Sudbury St., Boston, Mass., U. S. A.

FRANK H. POND,
Consulting Engineer and Expert,
709 MARKET STREET,
ST. LOUIS, MO

HORIZONTAL.
VERTICAL
Automatic Cut-off
ENGINES.
Yacht Engines,
Semi-Portable Engines.

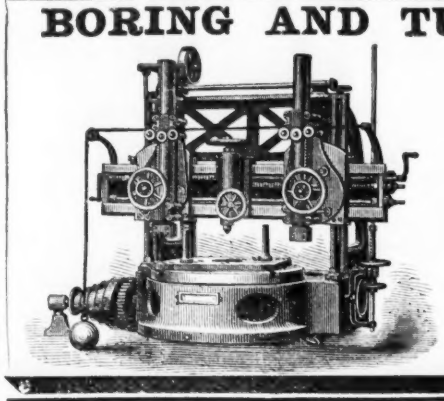
STEEL AND IRON
BOILERS.

All sizes to 225 horse-power.

Send for pamphlet and say where you saw this.

FITCHBURG STEAM ENGINE CO.
Fitchburg, Mass.

BORING AND TURNING MILLS.



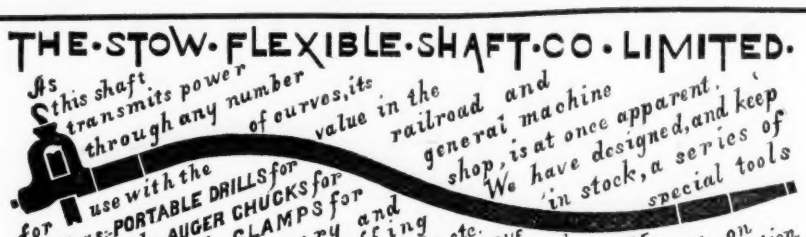
All Sizes: 4, 5, 6, 8, 10, and 12 feet Swings.

PATENTED IMPROVEMENTS.
New Patterns.

MACHINISTS' TOOLS,
The Latest and Best, at very moderate prices.

NILES TOOL WORKS,
HAMILTON, OHIO.

THE·STOW·FLEXIBLE·SHAFT·CO·LIMITED·


As this shaft transmits power through any number of curves, its value in the railroad and general machine shop, is at once apparent. We have designed, and keep in stock, a series of special tools for use with the shaft, as:-PORTABLE DRILLS for metals; AUGER CHUCKS for wood; CLAMPS for emery and buffing wheels, etc. CATALOGUE and PRICE LIST, on application.

500·NORTH·FIFTEENTH·ST·PHILADELPHIA·

TO STEAM USERS.
Save Fuel and Money.

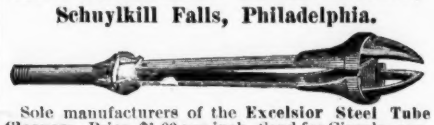
Obtain regular speed, and prevent explosion by using

PEERLESS DAMPER REGULATOR,

the greatest fuel-saving appliance ever invented. Adjustable to any pressure. In ordering mention pressure. Illus. catalogue sent on application. We set it up and guarantee performance. Price, $75.00.

AMERICAN STEAM APPLIANCE CO.
SOLE MANUFACTURERS,
13 and 15 Park Row - - NEW YORK.

RUFFNER & DUNN,
Schuylkill Falls, Philadelphia.



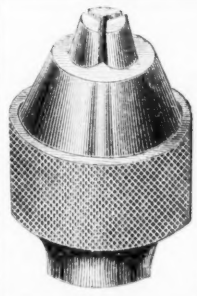
Sole manufacturers of the **Excelsior Steel Tube Cleaners.** Price, $1.00 per inch. Send for Circular containing names of users who consider it indispensable.

ENGRAVING ON WOOD
D. H. TUTTLE 5 BEEKMAN ST. N.Y.
Mechanical work a Specialty.

CARMICHAEL & EMMENS,
130, 132 & 134 Cedar Street, New York,
DEALERS IN
Iron and Steel Boiler Plate,
LAP WELDED BOILER TUBES, &c., &c.

Agent for Otis Celebrated Cast Steel Boiler Plates; the Coatesville Iron Co.; Pottstown Iron Co.; the Laurel Rolling Mills and Union Tube Works.
Wrought Iron Beams, Angles, Tees, Rivets, &c.

HEADQUARTERS
for every description of
MECHANICS' TOOLS.
A. J. WILKINSON & CO.
Illustrated Catalogue Free. BOSTON, MASS



ALMOND
DRILL
CHUCK

Made of Steel throughout, equal to doing any work required of it. Runs perfectly true.

For sale by all Machinists' Supply Stores.

T. R. ALMOND,
84 Pearl Street, Brooklyn, N. Y.

Improved Self-Regulating, Storm-Defying
WIND MILL.

The only Mill embracing all the recent improvements. Received Silver Medal at Paris Exposition in 1878. Five hundred in operation in the vicinity of New York. Every one warranted as to durability and quantity of water which can be pumped to any required height, from any location. The cost is small, compared with that of any other device now in use. Address, for Catalogues, **A. J. CORCORAN, 76 John St., New York.**

SECOND-HAND
AND
NEW TOOLS.

NEW LIST.

Miscellaneous Second-Hand Tools

All in Good Order, and will be sold very Low.

1 Engine Lathe 96 in. swing x 18 ft. Bed.
1 Engine Lathe 36 in. " x 15 ft. Bed.
1 Engine Lathe 36 in. " x 18 ft. bed.
1 Engine Lathe 17 in. " x 10 ft. "
7 Engine Lathes 18 in. " x 7½ ft. " (Chain Feed
1 Engine Lathe 24 in " x 8 feet Bed.
1 Engine Lathe 20 in. " x 6 "
1 Engine Lathe 20 in. " x 6 "
1 Shafting Lathe, 25 in. x 26 ft. bed.
5 Engine Lathes, 15 in. x 6 ft. bed.
1 Engine Lathe, 36 in. x 15 ft. bed.
1 Engine Lathe, 36 in. x 18 ft. bed.
1 Iron Planer, 24 in. x 4 ft.
1 Horizontal Boring Lathe.
2 Wood Turning Lathes.
1 Bement Double Pulley Lathe.
1 Shafting Lathe 22 in. " x 22 "
1 Speed Lathe.
1 Polishing Lathe 20 in. " x 25 "
1 Polishing Lathe 25 in. " x 22 "
1 Pulley Lathe, Double Head.
2 Spinning Lathes, " "
1 Iron Planer 60 in. x 60 in. x 30 feet.
1 Upright Drill 60 in.
1 Upright Drill 38 in.
1 Upright Drill 38 in.
1 Upright Drill 16 in.
1 Upright Drill 16 in.
1 Bench Drill.
1 Upright Boring Machine 78 in.
1 Pulley Polishing Machine.
1 Tool Grinder.
1 Pointing Screw Machine.
1 Daniels' Planing Machine.
One No. 2 Bolt Cutter.
One New "Hardaway" Bolt Heading Machine, to head up to ⅞-in. bolts.
A lot of Wood Working Machinery.
Six Small Punching Presses.
One N. Y. Safety Steam Power Co.
20 H. P. Upright Boiler with all connections, &c.

New Tools Very Low.

Five No. 2 Bolt Cutters, Wood & Light.
Please specify which of the above tools you want, and we will forward all particulars.

STEAM LAUNCH,

40 ft. x 7 ft.; draws 3 ft., Engine 5⅛ x 9; Boilers 32 x 48. Fitted with Carpets, &c., for pleasure.

A WOODRUFF & BEACH BEAM ENGINE,

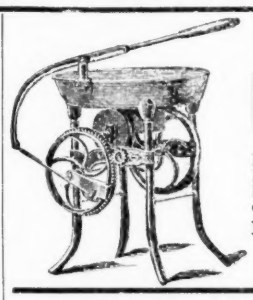
Low pressure, 42-in. cylinder, 84-in. stroke, with fly-wheel pulley, 20 ft. diameter, 36-in. face, and

FOUR TUBULAR BOILERS,

60 inches in diameter, 20 ft. long, and all connections practically as good as new.

For Sale by

The George Place Machinery Agency,
121 Chambers and 103 Reade St.,
NEW YORK.



EMPIRE FORGES

Improved, without Belts, Bellows, Crank Pins, Dead Centers or Back motion. Send for circular.

Empire Portable Forge Co.
COHOES, N. Y.

GEO. C. TRACY & CO
Counselors at Patent Law
EUCLID AVE. BLOCK,
CLEVELAND, O.

Before doing anything in regard to Patents, send for our 140 page book, "ALL ABOUT PATENTS," mailed free.

SECOND-HAND AND NEW
Machinists' Tools.
JULY 10th.

One No. 1 Square Arbor Lathe, *new*. Am. T. & Mch. Co. make.
One Engine Lathe, 92 in. x 20 ft. Wilmoth.
One Engine Lathe, 90 in. x 20 ft. Ames. New.
One Engine Lathe, 30 in. x 20 ft. Good order.
One Engine Lathe, 30 in. x 16 ft. Wheeler, new.
One " " 30 in. x 12 ft. Ames. New.
One " " 25 in. x 12 ft. New Haven.
Two " " 20 in. x 8 ft. Pond.
One " " 18 in. x 10 ft. Harrington.
Six " " 16 in. x 7 ft. Ames, new.
Six " " 16 in. x 8 ft. " "
One " " 13 in. x 5 ft. Gould. New.
Three " " 13 in. x 4 ft. Not Screw Cutting.
One Pulley Lathe, 20 in. x 6 ft.
One Hand Lathe, 18 in. x 4½ ft.
Two " " 20 in. x 8 ft.
Six " " 11 in. x 4½ ft. New Spencer.
Four " " 7 in. x 2½ ft. " "
One Planer, 26 in. x 7 ft. New Haven. New.
One " 20 in. x 4½ ft. Lincoln.
One " 20 in. x 4 ft. Lathe & Morse
One " 18 in. x 3 ft. Putnam.
One Gould Shaper, new. 10 in. stroke.
One Hendey Shaper, nearly new. 15 in. stroke.
One 2 Spindle Profiler. Wood & Light.
Two 2 Spindle Profilers. Jones & Lawson.
Two Brown & Sharp Universal Millers.
One Index Milling Machine. New. Heavy.
One No. 3 Garvin Milling Machine. New.
One Heavy Turret Head Machine.
One 22 in. Drill, Sliding Head. New.
One 20 in, " Prentiss, new.
One 5 Spindle Chucking & Drilling Mach. Remington.
One Heavy Drilling and Chucking Machine.
One No. 2 3 Spindle Drill. Smith & Garvin.
One 1 Spindle Drill. Smith & Garvin.
One Gear Cutter.
Three Sensitive Drills, drills to 3-16 in. hole. New.
One Boiler Makers' Combined Punch and Shear. New
Six Newell Punch Presses.
One No. 3 Wilder Punch Press. Geared. New.
One No. 4 " " " Geared. New.
One No. 6 Wilder Shear. Geared, new.
One No. 3 Wilder Bar Iron Cutter. New.
One 10 H. P. Baxter Engine.
Seven Stephens' Vises. Also, Parker Vises.
Belting, Shafting and Miscellaneous Machinery.

We will also have ready to deliver in 30 days New Ames Mfg. Lathes as follows:
Two Engine Lathes, 22 in. x 10 ft.
Four " " 24 in. x 12 ft.
Six " " 28 in. x 14 ft.

E. P. BULLARD,
14 Dey Street, New York.

LANE & BODLEY CO.
CINCINNATI, O.

Manufacturers of Wilson's Patent Free Open Double Disk

LEVER VALVE,

for Steam or Water, from 1¼" to 6". This valve has peculiar merits as a throttle valve for steam engines, and is well adapted to the use of a Sawyer's Valve, in place of the butterfly. Send for our catalogue and price list.

Headquarters for Machinists' Tools and Supplies.
CHAMPLIN & SPENCER,
154 East Lake Street, - Chicago, Ill.

Sole agents for the "Tanite" Emery Wheels and Grinding Machinery. Dealers in Screw Cutting Lathes from $50 to $150, with foot power, Small Amateur Lathes, Taps and Dies, "Twist Drills," Machine Screws, "Grobet Swiss Files," Machine Bits, Stubs' Steel Wire, Brown & Sharpe Tools, Emery, Crocus and Composition, Rouge, Drop Forged Lathe, Clamp and Die Dogs, Chucks, Wrenches, Hand and Bench Vises, Iron Levels, Metal Saws, Pattern Letters, Pliers, Calipers, Slide Rests, Steel Rules, Micrometer Calipers, Speed Indicators, "Metallic Corrugated Packing" for steam, air, gas or water joints, Steeline for hardening purposes, Upright and Hand Drills, Belting and Packing, Walrus Wheels, "Monk's Moulders' Tools," &c., &c

---

THE DIXWELL IMPROVEMENTS
For working Engines with
SUPERHEATED STEAM

Will reduce the consumption of fuel in non-condensing engines working under conditions otherwise favorable to economy, to 2.5 lbs. of coal per I. H. P. per hour, and in condensing engines to 1.75 lbs. of coal per I. H. P. per hour.

Prevent the waste from Cylinder Condensation, which, tests show, amounts in every engine running to from 20 to 40%.

We will test, free of charge, engines now running, and show parties desiring to examine the Improvements how much they can save.

GEO. H. BARRUS, Agent,
553 Shawmut Ave., Boston.

Send for Circular and Pamphlets.

CLARK'S RUBBER WHEELS.

This wheel is the best now in the market, and is attracting the attention of large manufacturers on account of the great saving of floors, which is ten times greater than the extra cost of this wheel.

Adapted to all purposes, viz.. warehouse trucks, platform trucks, scales, boxes, baskets and heavy casters. For full particulars, address

GEO. P. CLARK, Windsor Locks, Conn.

SEND FOR PAMPHLET. THE FAR-FAMED **AMERICAN LUBRICATOR.** TEN THOUSAND IN USE.
AMERICAN LUBRICATOR CO.
DETROIT. MICH. U.S.A.

WM. H. EDDY,
WORCESTER, MASS.

Manufacturer of

EDDY'S

TWIST DRILL GRINDING MACHINE,

Grinds Drills to the same shape as the best Machinists do by hand. No skilled workman needed to use it.

Refers to David W. Pond, Worcester, Mass.; N. B. Cushing, Jersey City, N. J.; W. H. Lewis; M. M. Kingland, N. J., and Hill, Clarke & Co., Boston, Mass. Write for prices and description.

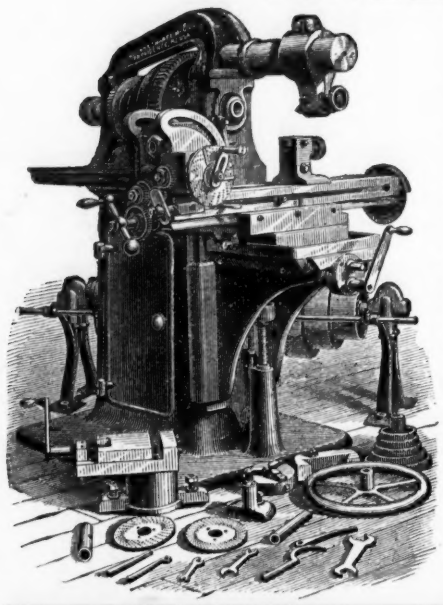
STRONG'S PATENT
Feed Water Heater and Filter,
MANUFACTURED BY
I. P. MORRIS CO., - PHILADELPHIA.

SALES AGENTS:

KELLY & LUDWIG, 720 to 724 Filbert Street, Philadelphia.
CUMMINGS & GRAY, Cincinnati.
E. T. COPELAND, 30 Courtlandt Street, New York.
McAFEE, WHEELER & CO., 210 Spear St., San Francisco.
MORTON, REED & CO., Baltimore
FRANK H. POND, 709 Market St., St. Louis.
GRAY & EVERSON, Pittsburgh.

BROWN & SHARPE M'F'G CO.

PROVIDENCE, R. I.



MANUFACTURERS OF THE

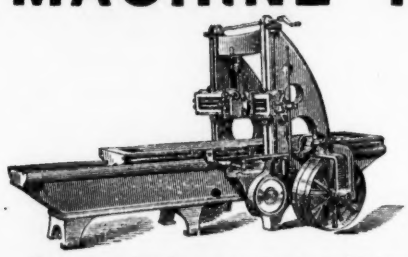
UNIVERSAL Milling Machine

This Machine has been designed especially to meet the wants of Steam Engine and Locomotive builders, and others engaged in the manufacture of heavy machinery and tools.

The essential features and motions are the same as in our smaller Universal Milling Machine, with such enlargement of the whole machine and its parts as would best adapt it for the class of work to be done. The cone has three diameters, each 3½ inches face. In addition, the cone is strongly geared, thus making six changes of speed. There are, also, the same number of changes of feed. The spindle boxes are of hardened cast steel, and, together with the spindle bearings, are carefully ground, and are provided with means of compensation for wear. The spindle will carry a cutter arbor projecting 15 inches, which is supported by an adjustable center at the outer end. Cutters of 8 inches or less diameter can be used. The horizontal movement of the spiral clamp bed upon the knee, in a line with the spindle of the machine, is 6½ inches, and the vertical movement of the spiral bed centers below the spindle centers is 11 inches. The spiral bed can be set at angles of 35° each way from center line of spindle, and can be fed automatically 22 inches, taking also 22 inches between the centers, and will swing 11½ inches.

☞ Illustrated Catalogue sent per mail on application.

MACHINE TOOL WORKS,



FORMERLY

FERRIS & MILES,

Twenty-fourth and Wood Streets

(Take Arch or Vine Street Car),

FRED'K B. MILES, Engineer. PHILADELPHIA

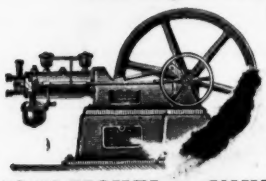
MACHINE TOOLS, STEAM HAMMERS, &c.

Having introduced many novel and valuable improvements into the construction of **SHAPING, SLOTTING, BORING and PLANING MACHINES**, as well as **Lathes and Drills**, we are now prepared to furnish these machines in greater perfection than ever before. By means of our improved devices the operations of turning, drilling, boring, planing and shaping, or slotting, can all be performed with a great saving of time and labor. It will be found worth any purchaser's while to examine our new methods of screw cutting, feed-gearing and convenient arrangements and attachments for enabling work to be done with the least possible expenditure. We would direct special attention to our new **4 FT. RADIAL DRILL**, with **6 Automatic Feeds, 10 IN. STROKE SHAPING MACHINES, 17 IN. SQUARE PLANING MACHINES and PATENT SCREW CUTTING LATHES**, which cut 16 threads and give 16 feeds **without changing gears. Send for Catalogue.**

FRED'K B. MILES.

NEW OTTO SILENT GAS ENGINE.

Working without Boiler, Steam, Coal, Ashes or Attendance.



STARTED INSTANTLY BY A MATCH, IT GIVES FULL POWER IMMEDIATELY.

WHEN STOPPED, ALL EXPENSE CEASES.

No Explosions; No Fires nor Cinders; No Gauges; No Pumps; No gineer or other attendant while running. Recommended by Insurance apanies.

UNSURPASSED IN EVERY RESPECT for Hoisting in Warehouses, rinting, Ventilating, Running small Shops, etc.

2, 4 and 7 H. P. and upwards. Built by

SCHLEICHE[illegible]CHUMM & CO., 3045 Chestnut St., Philadelphia.

Boston Agency, HILL, CLARKE & CO., 36 & 38 Oliver Street.

COPE & MA[illegible]ELL M'F'G CO.

HAMILTON, OHIO., U. S. A.

New and Improved Patterns of

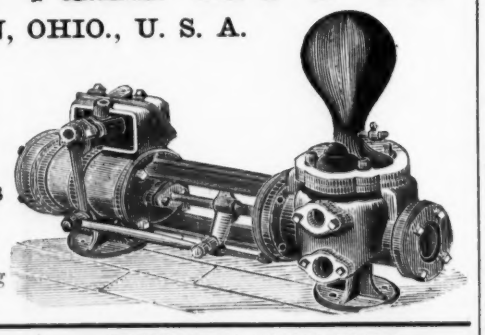
STEAM PUMPING MACHINERY,

FOR

Boiler Feeding, Water Works

and all general and special Pumping purposes.

Send for New Catalogue, illustrating every variety of Pumping Machinery.



Machines at reduced prices, and Wheels *Guaranteed.*

LEHIGH VALLEY EMERY WHEEL CO.

Send for our new Illustrated Catalogue

Weissport, Penn.

RECENTLY PUBLISHED.

WORKSHOP RECEIPTS

For the use of manufacturers, mechanics and scientific amateurs.

By ERNEST SPON.

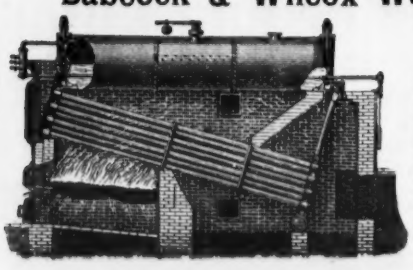
Crown, 8vo, illustrated. Price, $2.00. Send for Catalogue of books for practical engineers.

E. & F. N. Spon, 446 Broome St., N. Y.

STURTEVANT BLOWERS, PIPE FITTINGS, &C.

ALBERT BRIDGES, 46 Cortlandt Street, New York.

Babcock & Wilcox Water-Tube Steam Boiler,



Over 40,000 Horse-Power Now in Use. Adapted for all purposes. Safety from Explosions.

In sections easy of transportation. No bolted, screwed or packed joints. All joints made by expanding wrought iron tubes into bored holes. Can be erected or repaired by ordinary mechanic. Easily cleaned from soot or sediment. Adapted to all kinds of fuel. Steady water line and dry steam. No leaks from unequal expansion. Rapid steaming. Highest attainable economy. Centennial Exposition Medal awarded this boiler for highest economy and efficiency on test.

Illustrated Circulars and other desired information promptly furnished.

BABCOCK & WILCOX, Engineers, 30 Cortlandt St., New York.

THE PRATT & WHITNEY CO.

HARTFORD, CONN., U. S. A.

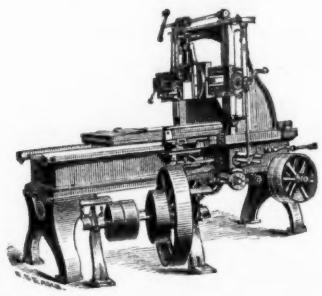
MANUFACTURERS OF

MACHINISTS' TOOLS,

FOR MACHINISTS, GUN & SEWING MACHINES.

MAKE SPECIALTIES OF

Shaping Machines, Pillow Shapers,



Power Planers 16 x 16 to 48 x 48 inches square.

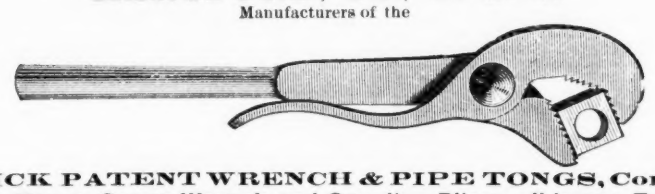
AND VARIOUS LENGTHS.

All Feeds Automatic.

THE BILLINGS & SPENCER CO.

HARTFORD, CT., U. S. A.

Manufacturers of the



BARWICK PATENT WRENCH & PIPE TONGS, Combined.

Pipe Tongs, Screw Wrench and Coupling Pliers, all in one Tool.

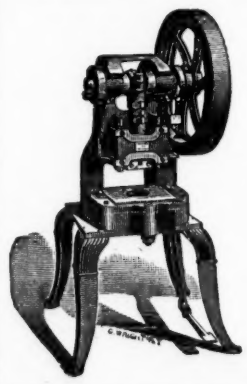
Will not crush a pipe. Adapted to any shaped object, round, square, flat or oval. Always ready for their work without altering or changing any of the parts. Drop Forged from best Norway Iron and Bar Steel.

PRICE LIST.

No. 0.	Nickel-plated, takes from No. 7 Wire to ¼ inch Pipe	$2 00
" 1.	Finished and Polished, takes from Gas Burner to ¾ inch Pipe	2.50
" 2.	Ground and Finished takes from ½ inch to 1⅛ inch Pipe	4.00
" 3.	" " " " 1 " 2 " "	5.00
" 4½.	" " " " 2 " 3½ " "	10.50

Steel and Iron Drop-forgings of every description for Guns, Pistols, Sewing Machines, Machinists' Tools and Machinery generally. Send for Illustrated Catalogue and Price List.

GOLD MEDAL AWARDED, PARIS EXPOSITION, 1878.



BLISS & WILLIAMS,

Plymouth, Pearl and John Streets,

BROOKLYN, N. Y.

Manufacturers of all kinds of

Presses, Dies and Special Machinery

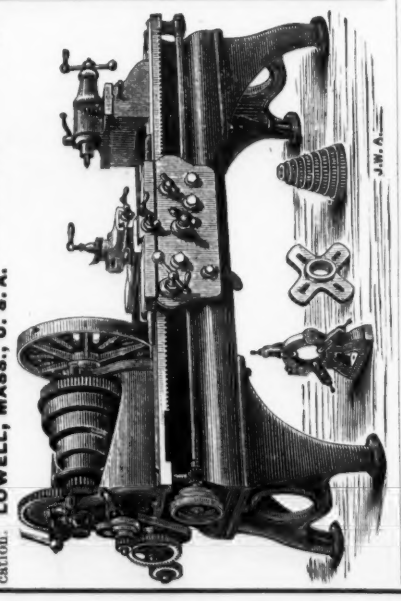
FOR WORKING SHEET METALS, &c.

FRUIT AND OTHER CAN TOOLS.

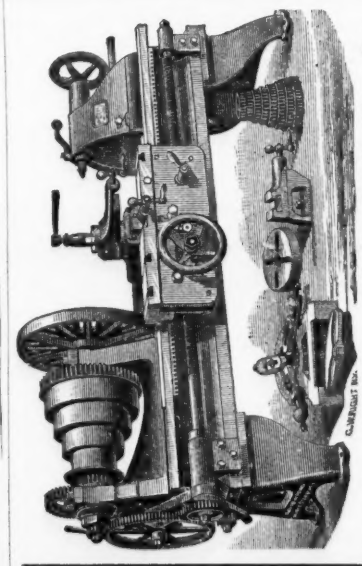
Iron Gears of all sizes and kinds made to order.

Brass Gears for Models, etc., on hand in large variety.

Geo. B. Grant, 100 Beverly St., Send for circular. BOSTON.



GEO. W. FIFIELD, Manufacturer of ENGINE LATHES from 16 to 48 in. swing. Cuts, Photographs and Prices furnished on application. LOWELL, MASS., U. S. A.



Engine Lathes, Planers, Drills, &c.

DAVID W. POND, Worcester, Mass.

Send for Catalogue of New Designs.

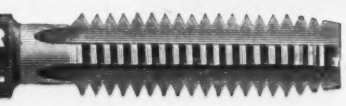
AIR COMPRESSORS.

PRICES REDUCED. SEND FOR NEW CATALOGUE.

CLAYTON STEAM PUMP WORKS,

14 AND 16 WATER STREET, BROOKLYN, N.Y.

J.M. CARPENTER PAWTUCKET, R.I.



MANUFACTURER OF TAPS & DIES.